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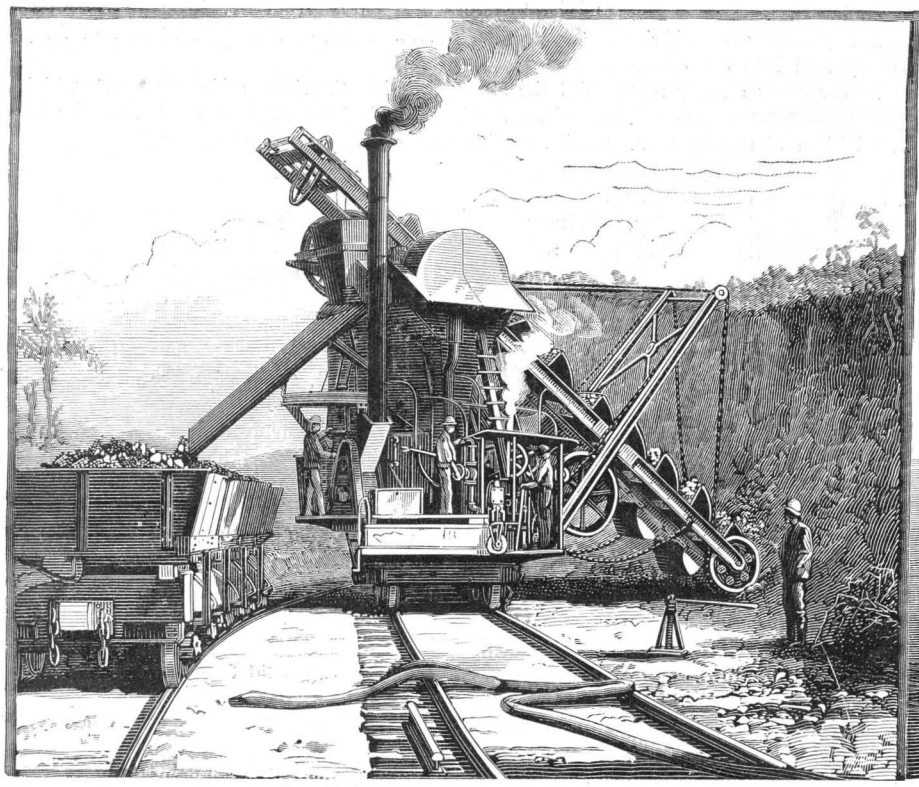

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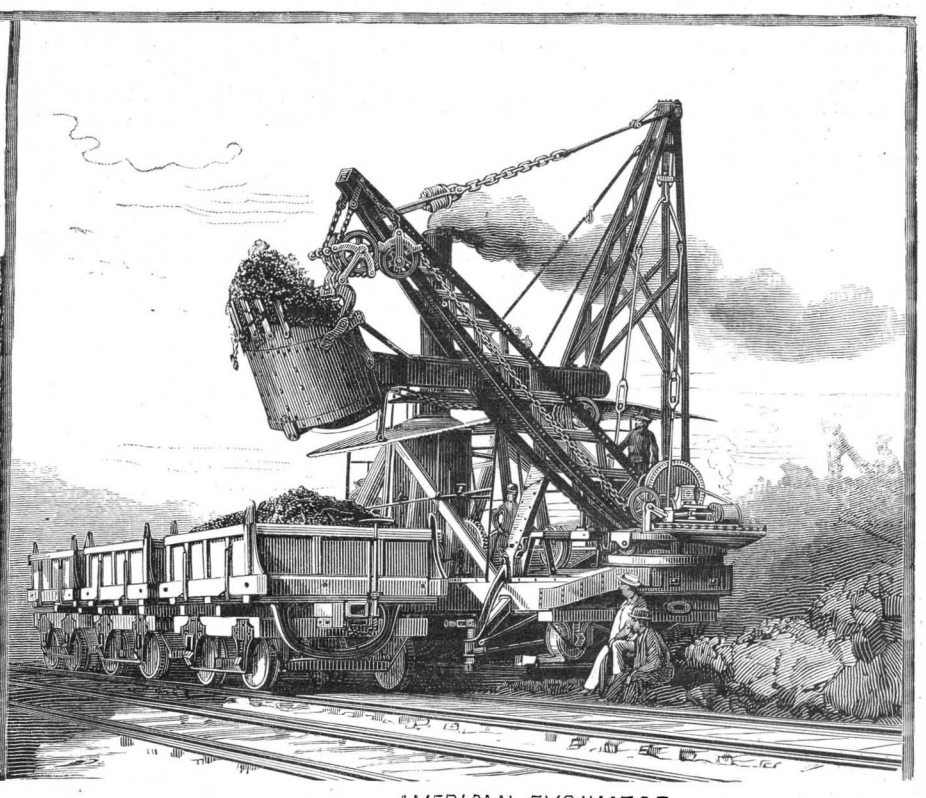

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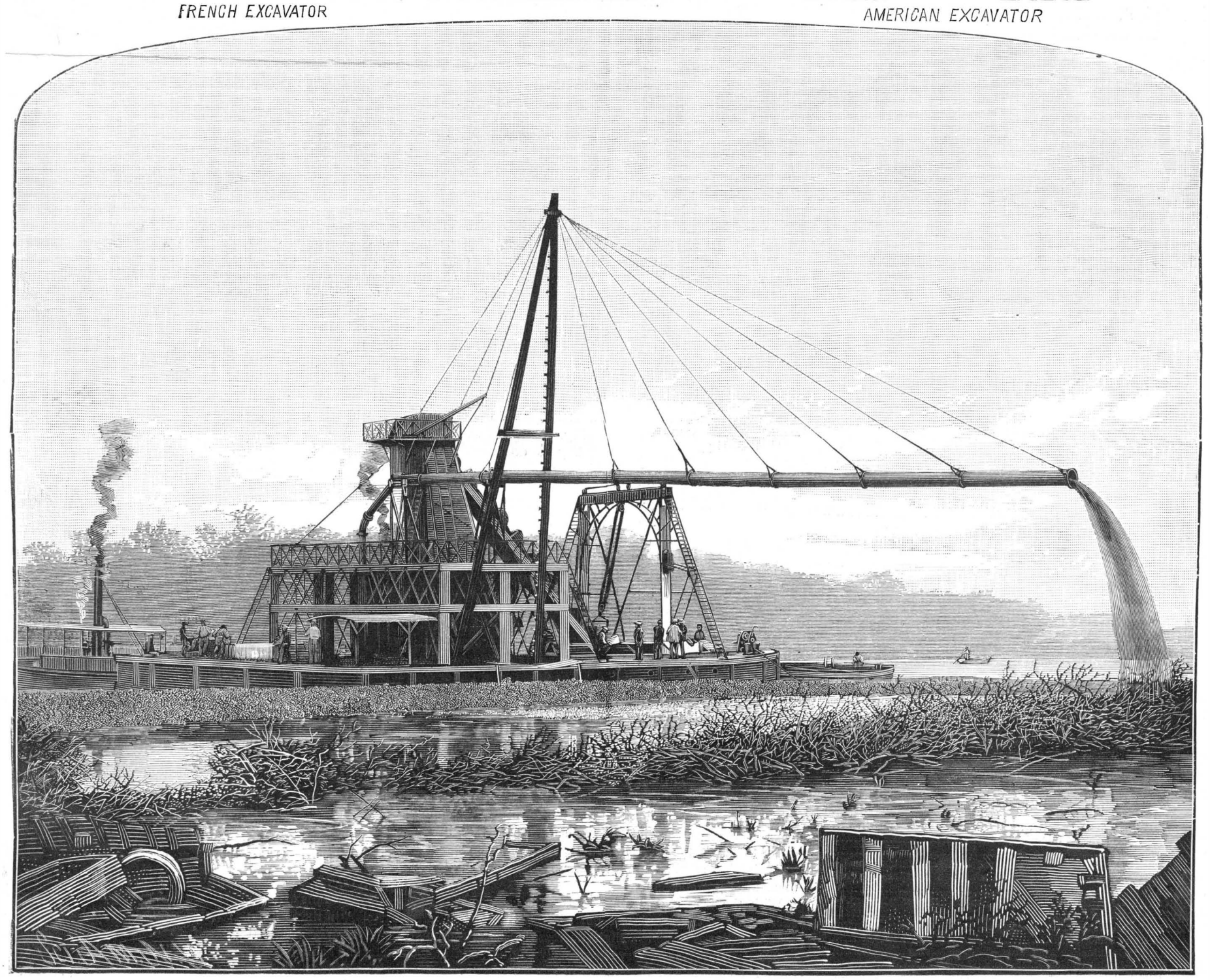

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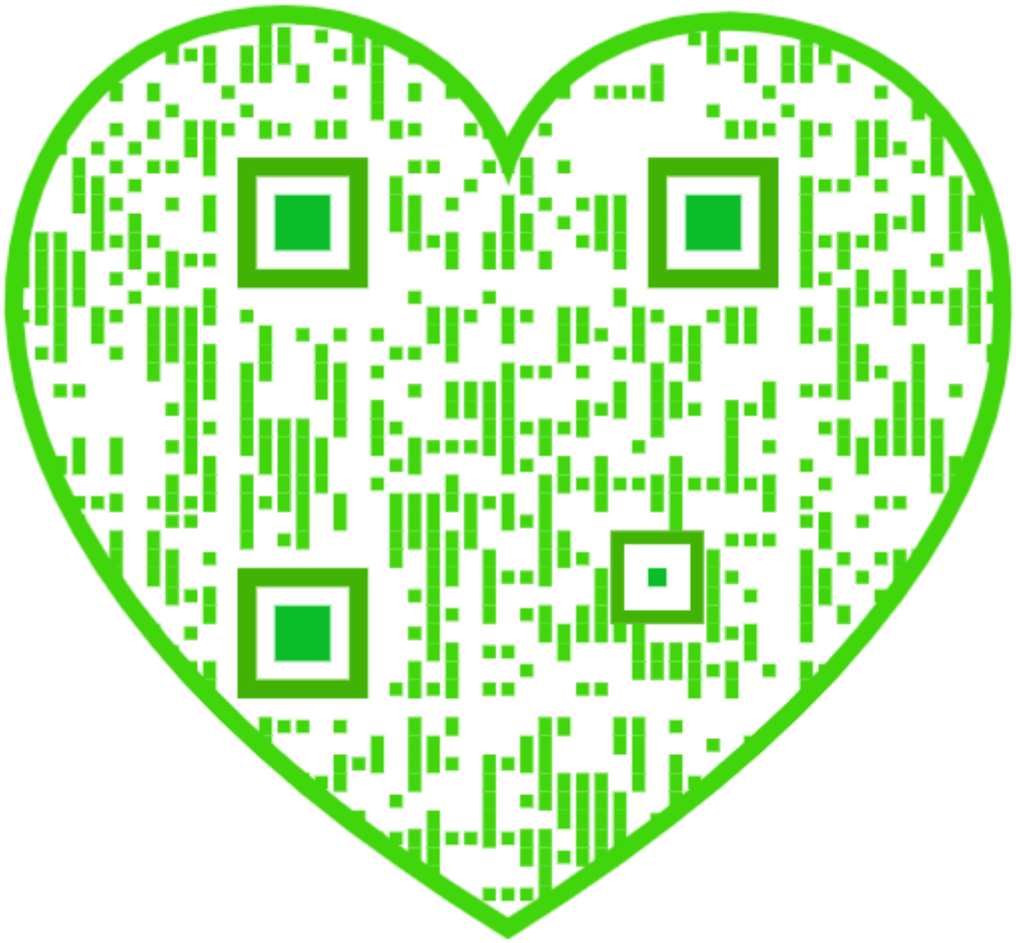

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CONDITIONS OF LIFE IN THE DEPTHS OF THE SEA.

One of the most striking of recent scientific explorations is that undertaken by the Travailleur and the Talisman, conducted by M. Milne Edwards and other savants chosen by the Government and Academy of France. The fact which attracts attention on reading the narrative of these interesting dredgings is that the ocean appears to have two superimposed faunas. At the surface we encounter all the species that we know at present; they live at this point in a limited area, but at 2,500 to 3,000 meters below (8,188 to 9,825 feet), we meet individuals more and more rare, according as we descend. Beneath we find an abyssal fauna composed of singular creatures which never rise, and are seldom encountered lower down than 3,000 to 4,000 meters. The ocean thus seems to contain two regions, one over the other, and both characterized by a peculiar fauna.

The question arises, What result might we expect if the inhabitants of either zone were transported into the conditions and home of their neighbors? We know already that the animals of the very great depths reach the surface dead, and that their tissues are soft, friable, and readily torn. The reverse of this, though easily experimented upon, has not as yet been examined, viz., the removal of a surface form to the great depths. In view of this possible inquiry, M. Regnard has made some interesting experiments in his laboratory on this subject. He has utilized an apparatus furnished to him by MM. Cailletet and Ducretet, which permitted him to obtain a pressure of more than 1,000 atmospheres, corresponding to a marine depth of more than 10,000 meters, and he has subjected to varying pressures numerous forms of life.

In a tube provided with a capillary opening he first placed examples of ferments, for example, the yeast of beer, and suddenly increased its pressure to that of 600 to 1,000 atmospheres. It was left in this condition some hours and was then withdrawn. The ferment was then introduced into a glass with sugared water at a proper temperature. For more than an hour it remained inactive, but at the end of that time it revived, and started its normal action. The ferment was then taken, reintroduced in the apparatus with grape sugar, and subjected to a pressure of 600 to 700 atmospheres. The ferment under the normal atmospheric pressure began its work in less than a quarter of an hour, but that under pressure remained dead and inert. But released from its excessive pressure, it resumed its ordinary functions.

Thus the great pressures of the ocean depths induce inaction if not death in the unicellular organisms of the surface, and in fact the naturalists of the Talisman have never brought to the surface any substances in process of fermentation or decomposition. But soluble ferments are unaffected by these high pressures. Thus cooked albumen mingled with saliva was put under 1,000 atmospheres, and all the albumen was converted into sugar. This might have been anticipated, as otherwise all the beings of the great depths would have different physiological natures from our own.

Plants followed in these experiments the ferments. It is known that below 60 meters they are scarcely found. There is no abyssal flora. Sea weeds were put under pressure, and then exposed to the sun. They slowly evolved oxygen, then died, and fell to pieces in some hours. Some seeds, under 1,000 atmospheres, remained torpid a week after being released, then began to germinate, while others not put under pressure had in two days thrown out their cotyledons.

The same phenomenon is noticed with the infusoria. Under 600 atmospheres pressure the creatures, subjected to this excessive pressure, of all species fall to the bottom of the experimental tube, and others, upon liberation, scarcely move over the surface of the microscope slide. But in a short time they resume their vitality. Mollusks submitted to great pressure act in the same way as do annelids and crustaceans. Death ensues in all these instances upon a too prolonged exposure to these enormous pressures.

As regards the higher vertebrate forms, the experiments assume a more interesting character. A golden cyprin was subjected to a pressure of 100 atmospheres (1,500 pounds to the square inch), the precaution being first taken of emptying its swimming bladder under an air pump, as excessive pressure would have forced the contents of the bladder into the blood, and these again suddenly disengaged, upon the removal of the pressure, would have killed the subject.

Under 100 atmospheres the fish did not seem incommoded; under 200 it came out a little stunned, but soon revived. Under 300 atmospheres it was dead or dying, and under 400 atmospheres, corresponding to more than 4,000 meters (13,000 feet) in depth, it was dead and absolutely rigid.

The fish of the surface may penetrate the depths of the ocean as low as 6,550 to 8,188 feet, but beyond that death must follow their migration. One remarkable feature was noted in the case of these dead fish—the extreme rigidity of the muscle. In order to better examine this matter, the thighs of frogs were submitted to different pressures, and at 400 atmospheres the rigidity was so extreme that it was easier to break the frog in two than to bend its members. This rigidity, assumed almost instantly, persisted up to the moment of putrefaction.

With the frog at 100 atmospheres, the contractility and excitability of the muscle are not sensibly diminished. At 200 atmospheres there is a slight decrease in these functions; at 300 atmospheres the nerve is scarcely excited; and at 400 there is a complete disappearance of any sensitivity.

On examining this closer, it was found that the parts subjected to pressure had increased in weight. The paws of the frogs, which weighed 15 grammes, weighed 17 after five minutes' pressure under 600 atmospheres.

The question arises, Was there penetration of the water into the muscle, or was there a chemical hydration? And this singular result is exactly the reverse of what is observed when the inhabitants of the deep sea are brought to the surface. Whereas the surface animals become dense and rigid under the abnormal pressures encountered in the abysses of the sea, the denizens of these latter are rendered soft, friable, and excessively flaccid. These investigations are being pushed further, and cannot fail to attract attention.

FROM BROADWAY TO THE FERRIES.

More than one hundred thousand persons cross the North and East Rivers every day from Brooklyn, Jersey City, and Hoboken to New York, on the different lines of ferry boats.

All the streets fronting the rivers and those streets which afford approach to the docks and piers are thronged with trucks, market wagons, horse cars, etc., to a degree which renders the approaches to the ferry houses sometimes almost impossible for pedestrians.

The public markets are located in the vicinity of a number of the ferry landings, and early in the morning the market wagons with their stock of meat, vegetables, fruits, hay, etc., add to the crowd of other vehicles on these river streets, and increase the obstruction at the crossings.

Another serious evil is the filthy condition of the streets which border the river front, and also those upon which the vegetable and fruit markets are located, with barrels full of rubbish all along the curb, and with the gutters stopped and dammed with refuse and decaying fruit and vegetables. After a rain the accumulation of mud renders the streets so sticky in some places and slippery in others, that walking becomes very difficult, even after a policeman has made a passageway for the pedestrian between the carts, market wagons, and trucks.

There are a great many men doing business in New York who reside a portion or the entire year on Long Island and in New Jersey, and their universal complaint is the difficulty of getting from the ferry terminus, across the river streets, to their places of business, and back to the ferry again.

It is not an uncommon remark that "I do not mind traveling by rail twenty or thirty miles every day between my home and place of business, but the mud at the crossings, and the crowd of vehicles blocking up the streets around the ferry, is the great drawback," and to those going back and forth daily this is no doubt the most objectionable part of the journey.

How to obviate the difficulties above set forth is a problem which must be sooner or later solved. Why our enterprising capitalists have not undertaken some measures before this for accomplishing it, is hard to understand. It would not seem to be a difficult matter to do.

Among other plans it has been suggested that a balcony wide enough for foot passengers might be constructed along the second story of the warehouses, fronting each side of the streets leading from the ferries to Broadway, and extend bridges across the transverse streets. By this plan the second story of the buildings might be as available for retail stores and more convenient for offices than the ground floor of the stores as now constructed.

But it is somewhat doubtful if all the owners of the buildings on the streets would consent to such an innovation. We believe, however, that if such a scheme could be carried out, the value of the property along such thoroughfares would be enhanced, and the benefit to the public would be very great.

On another page of this issue we reproduce from a recent number of the SCIENTIFIC AMERICAN SUPPLEMENT a view of an elevator and iron bridge recently constructed in the suburbs of the city of Stockholm, the capital of Sweden. The grades from our water fronts to Broadway are not as steep or the distance as great, but an elevator at each of our ferries, with a bridge extending over the streets to intersect with Broadway, something after the plan of the Stockholm elevator and bridge, could easily be constructed and without great cost.

Stairs leading from the intervening streets up to the roadway of the bridge could be readily arranged, for the accommodation of persons doing business on streets between the ferries and Broadway.

Of course it would not be necessary to raise a structure as high as the elevator represented in the illustration, but with a properly constructed tower and broad promenade, and with elevator cars of sufficient size to accommodate a large number of people at a time, a means of communication would be afforded between the ferries and Broadway such as would make the heart of the Jerseyman and Long Islander leap with joy.

Mr. Heath's "Gun Experiments."

Mr. W. McK. Heath emphatically protests against our criticism on his experiments relative to "bursting of gun barrels," in the SCIENTIFIC AMERICAN of May 10. He says he has simply confined himself to observing and stating facts, and has had no theory relative thereto, but only quoted in this connection from a distinguished army officer, his own opinion being that "facts are the great, grand, glorious things, while theories are cheap."

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ASPECTS OF THE PLANETS FOR JULY.

VENUS

is evening star until the 11th, when, to the regret of every lover of the stars, she deserts the western sky, where she has reigned with queenly majesty and grace for nearly ten months, and is seen there no more. She is not lost, however, for when she disappears from the sun's eastern side as evening star, she reappears on his western side as morning star. This event is called her inferior conjunction. It takes place on the 11th, at 9 o'clock in the evening. She then passes between us and the sun, with her dark side turned toward the earth, like the moon at new moon. In like manner she made the passage on the never to be forgotten 6th of December, 1882, but with this difference:

At the present inferior conjunction, she passes above the sun, and is invisible. At the previous inferior conjunction, she was near one of her nodes, and was projected on the sun's surface as a round black orb, while the grand phenomenon of her transit made the event memorable to every observer. The like will not be seen again until the year 2004, for, at every intervening inferior conjunction, she will pass above or below the sun, and no mortal eye will detect her presence as she passes.

The reason is plain. The orbit of Venus is inclined about three and a half degrees to the ecliptic, so that she is half the time above the sun's path, and half the time below it. She must be at or near one of her nodes or crossing points to bring her directly between the earth and sun, and make her passage or transit visible to terrestrial view.

The interval between an inferior conjunction and the one next succeeding is 584 days. This is called the synodic period of Venus, although she completes her revolution around the sun in 224 days. As the earth and Venus are both moving, nearly three revolutions of Venus are required to bring the sun, Venus, and the earth into line.

Our brilliant celestial neighbor moves very rapidly in this portion of her orbit, and soon becomes visible as the brightest star that shines in the morning sky. She will be worth getting up early to behold at the end of the month, rising then a few minutes after 3 o'clock, nearly two hours before the sun. The waning crescent has become the waxing crescent. Hesperus, the evening star, is transformed into Lucifer, the light bearer. Beautiful as she will be when, a month or two hence, she anticipates the dawn, her morning charm never quite equals the lovely appearance she puts on amid the glowing splendor of the twilight sky or the grand proportions she assumes as she slowly sinks below the western hills.

The fair star is being watched by a trained observer, who seems to be on the eve of making important discoveries. She is so closely veiled by an atmosphere of clouds, that it is almost impossible to obtain a glimpse of anything upon the body of the planet. M. Trouvelot has not been deterred by the difficulties in the way, but has made diligent studies of Venus since 1877. During that year, he found two remarkable white spots on opposite limbs of the planet near the extremity of the cusps or horns of the crescent. The southern spot was the brighter of the two, and appeared to be composed of many bright points, forming on the northern border a row of brilliant, star-like dots of light. The spots disappeared in about three months. Since that time—February, 1878—M. Trouvelot has observed on 242 occasions, either one or the other of the luminous spots and occasionally both of them, and has made 120 drawings. Since April of the present year, he has not lost sight of the northern spot, which alone was visible at that date. The spots are not affected by the planet's diurnal rotation, and he therefore infers that the axis passes either through or very close to their center. The spots appear almost permanent, and Trouvelot thinks they are the summits of high mountains projected beyond the cloudy envelope that hides the planet.

The observations of 1877–78 were made in Cambridge, Mass. Those during the present year were made at the Observatory of Meudon, near Paris. M. Trouvelot is one of the most skillful observers in astronomical ranks, as well as one who holds a place among the highest for his drawings of the sun and the different members of his family of worlds. His observations and drawings are as reliable as any that human skill has yet attained. We trust his practiced eye will detect something more than two bright spots on the face of our interesting neighbor. If only he could bring to life and light her long lost satellite, astronomy would bestow upon him distinguished and immortal fame.

The right ascension of Venus on the 1st is 7 h. 50 m.; her declination is 18° 33′ north; and her diameter is 55·8″.

Venus sets on the 1st about a quarter after 8 o'clock in the evening; on the 31st, she rises soon after 3 o'clock in the morning.

MERCURY

is morning star until the 12th, and then becomes evening star. We give Venus the first place on the monthly record, for being the most brilliant and interesting of the planets, and place Mercury second on the list on account of the contrast in the movements of the two planets. On the 12th, at midnight, Mercury is in superior conjunction with the sun, thus reversing the conditions described for Venus. For he passes to the sun's eastern side, instead of his western, beyond the sun, instead of between him and the earth, and is at his greatest distance from the earth, instead of the least. The course of the two planets clearly illustrates the difference between inferior and superior conjunction, as indeed the words plainly indicate. In the former case, the planet is joined to the sun on his inferior or inner side. In the latter case, on the superior or outer side.

Although, in reality, Mercury and Venus are as far apart as they can be, viewed from the earth they appear to be near together, and are in conjunction on the 12th at 1 o'clock in the morning. Venus, four hours after inferior conjunction, encounters Mercury eleven hours before superior conjunction. The planets meet and pass on the celestial road, as we see them, both morning stars at the time, the one moving eastward toward the sun, and the other westward from the sun. Though both planets take on similar aspects as they revolve around the sun, swift-footed Mercury will complete more than five synodic periods while the more stately Venus completes one.

Mercury is in conjunction with Jupiter on the 23d, at 3 o'clock in the morning, being 1° 10′ north. Both planets are too near the sun to make the conjunction worthy of observation, even if the time were favorable.

The right ascension of Mercury on the 1st is 5 h. 55 m.; his declination is 23° 24′ north; and his diameter is 5·6″.

Mercury rises on the 1st about a quarter before 4 o'clock in the morning; on the 31st he sets a few minutes after 8 o'clock in the evening.

JUPITER

is evening star throughout the month, but will soon be too near the sun to be detected in the glare of twilight. He reigns alone. Venus, his great rival, is out of the way. He will enjoy the supremacy but a short time, for he is rapidly approaching his far greater rival, the sun, in whose overpowering beams his feeble light will be eclipsed. Even the giant Jupiter has to succumb to the mighty power of the central orb, and is, as it were, blotted from the sky when he dares to encroach on the solar domain.

Jupiter hastening toward the sun is met on the way by Mercury, the smallest of his brother planets, hastening from the sun. They are in conjunction on the 23d, an event already referred to.

The right ascension of Jupiter on the 1st is 8 h. 40 m.; his declination is 19° north; and his diameter is 30·2″.

Jupiter sets on the 1st soon after 9 o'clock in the evening; on the 31st he sets at half past 7 o'clock.

MARS

is evening star. He is near Uranus during the whole month, setting about half an hour earlier on the 1st, and about a quarter of an hour later on the 31st. Meantime, they meet and pass each other. For they are in conjunction on the 19th, at 2 o'clock in the afternoon, when Mars is 11′ south of Uranus. There are difficulties in the way of observing this event. It occurs in daylight, and even if the time were favorable, it would require a powerful telescope to pick up Uranus, he is now so far away from the earth. The sea green tint of Uranus, in contrast with ruddy tint of Mars, would make a telescopic picture fair to see.

The right ascension of Mars on the 1st is 11 h. 4 m.; his declination is 6° 54′ north; and his diameter is 5 8″.

Mars sets on the 1st about a quarter before 11 o'clock in the evening; on the 31st he sets at half past 9 o'clock.

URANUS

is evening star; besides being in conjunction with Mars, his path lies very near to Beta Virginis, a star of the third magnitude in the constellation Virgo. The conjunction takes place on the 30th, at noon-day, the planet being 2′ north of the star. The approach is so close as almost to become an appulse.

There has been recent news from Uranus. M. Perrotin and Mr. Lockyer, studying the planet through the 15-inch equatorial in the Observatory at Nice, found a bright spot near the equator. It was a very difficult object, and much doubt was felt as to its real existence. But repeated observations confirmed the first impression, and made the observers conclude that they saw a luminous belt instead of a single spot. From observations of its movements, they deduced a rotation period for Uranus of about ten hours. Thus these eagle-eyed observers actually saw this huge sphere rotating on its axis as they watched the progress of the luminous spot over the disk, though they were nearly 2,000,000,000 miles away. If these observations are confirmed, a most welcome discovery will enrich astronomical annals, and "unknown" will no longer find place in the tables for the axial rotation of Uranus.

The right ascension of Uranus is 11 h. 40 m.; his declination is 2° 53′ north; and his diameter is 3·5″.

Uranus sets on the 1st about a quarter after 11 o'clock in the evening; on the 31st he sets a quarter after 9 o'clock.

NEPTUNE

is morning star. There is nothing noteworthy in his course. He is approaching the earth, rising before midnight at the end of the month, and would be an interesting object in the morning sky, if we were near enough to see him.

The right ascension of Neptune on the 1st is 3 h. 22 m.; his declination is 16° 45′ north; and his diameter is 2·5″.

Neptune rises on the 1st not far from half past 1 o'clock in the morning; on the 31st he rises soon after half past 11 o'clock in the evening.

SATURN

is morning star. He is far enough from the sun to be visible to early risers, and will soon give promise of the bright aspect he will assume a few months hence, for great events occur in his history in the years to come. He has perceptibly advanced in his eastward course, and is leaving behind Aldebaran and the Pleiades, his close companions of the last year. Observers will find him nearly south of Capella, rising on the 1st an hour and a half before the sun, and on the 31st more than three hours before the sun.

The right ascension of Saturn on the 1st is 5 h. 4 m.; his declination is 21° 26′ north; and his diameter is 16″.

Saturn rises on the 1st at 3 o'clock in the morning; on the 31st about half past 1 o'clock.

THE MOON.

The July moon fulls on the 8th, at 11 minutes after 5 o'clock in the morning, standard time. On the 17th, two days after the last quarter, she is near Neptune, and on the 19th near Saturn. On the 21st, the day before new moon, she is in conjunction with Venus. On the 23d, the one-day old moon is near Jupiter and Mercury. On the 26th, she is in conjunction with Uranus and Mars. The moon thus passes each planet in turn, and shows the order of their position in regard to the sun, the old moon drawing near Neptune, Saturn, and Venus, on the sun's western side, and the new moon approaching Jupiter, Mercury, Uranus, and Mars on the sun's eastern side.

The moon occults in her path only three small stars visible in this belt of the world's territory. Observers from other lookouts are more fortunate. For our satellite occults Neptune to observers in some localities between 44° and 74° south latitude, and occults Venus, that most charming sight, to some favored mortals whose lookout lies between the limiting parallels of 90° and 54° north.

HOW PILE BUTTONS ARE MADE.

The commonest articles of daily use sometimes awaken curiosity as to the method of their production; one of these is the buttons used on coach cushions and for similar purposes. They appear to be balls of pile or plush, like those ball ornaments used sometimes on ladies' and little girls' dresses. But these ornaments are usually made by hand, by being wound or threaded on a paper or pasteboard disk around a central string, the yarn being cut around the center with a sharp knife, the paper or pasteboard torn out, and the pile or yarn being beaten into fluffy form and shaped with scissors. In the manufacture of coach trimming buttons the principle is the same, but the method is different.

The woolen yarn of which the buttons are composed is slightly twisted into a rope of the proper diameter, and is then circumferentially sewed at distances of about half an inch. At these sewings the rope is cut into sections, making a slightly convexed disk on the side of the free ends of the yarn, the sewed portion remaining compact. This portion is then placed on an eyed base of thin metal, such as forms the under side of cloth buttons, and the base and worsted are forced into a tube by a press, the sides of the tube turning up the edges of the metal base to form a cup, thus holding securely the tightly sewed edges of the woolen fluff. As the button comes from the press it is almost flat, instead of being nearly globular, the pile top being slightly convex and the bottom of metal standing out from the mass.

Now comes the most interesting portion of the manufacture, and its last stage. The flat buttons are placed in a rotating perforated cylinder, and turned over a steaming caldron of hot water. Only a few minutes' exposure suffices to puff out the buttons into almost perfect spheres, a shape that they will retain until after long compression.

The around and around sewing is done by an ingenious attachment to a sewing machine which rotates the rope of yarn and feeds it along by intermittent adjustable feed to accommodate the different sizes of buttons. This attachment is the invention of an ingenious mechanic in Bridgeport, Conn. It is used also for staying the ends of ropes for the running rigging of ships, reefing points, clothes lines, and other cordage, to prevent untwisting, and to produce a solid end for passing through blocks, eyebolts, etc.

Defective Castings.

It is stated in the English papers that an examination of the broken girders of the fallen railway bridge at Denmark Hill showed that one of them was "honey-combed with air bubbles;" and it is assumed that, as this girder gave way, the extra weight thus thrown upon the others caused the accident. It is almost unnecessary to say, a correspondent in *Iron* says, that the so-called "air bubbles" are really hydrogen cells, and that the only explanation that has been (and probably ever will be) afforded of the source of this hydrogen is that, if not exclusively, it is mainly derived from the moisture of the atmospheric blast, which becomes decomposed on coming in contact with molten iron or steel, its hydrogen being thereupon absorbed by the metal. This occurs not only in the steel converter, but also in the blast furnace and in the remelting cupola. As a consequence, both steel and iron castings are unreliable, and a constant source of danger wherever their soundness is essential to safety; and they are accordingly unfitted for a number of important purposes for which forged metal, at a far higher cost, is considered necessary.

I do not propose, adds Mr. Fryer, to refer to any of the various methods and expedients which have been devised, and which are sometimes employed to cure the evil. It will, however, seem remarkable that no attempt has yet been made to get rid of the defect itself by eliminating the moisture from the blast, and thus removing the cause. One practical trial in that direction would go further to solve the whole question than all the theories that have been advanced, and all the laboratory experiments that have been tried since Dr. Muller's famous discovery of the real nature of the so-called "air bubbles" or "blowholes."

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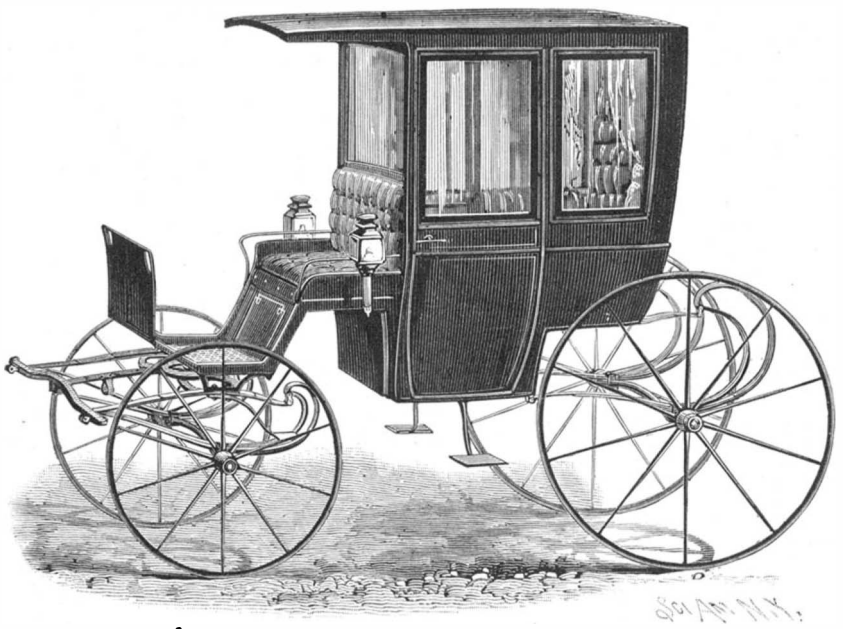
NEW SPRING GEARING FOR VEHICLES.

The peculiar shape of the springs shown in the accompanying engraving, in connection with the gearing by which they are made to carry the body of the coupé, presents some strong advantages. By this spring and gearing a direct draught is obtained from the axle trees, and the body of the vehicle is supported at any desired point, in a manner much superior to that realized in the ordinary platform or other gearing. The spring is so shaped that its different bends support each other, compelling the leaves to roll together with the varying downward pressure upon them, thus giving great strength, as well as adding much to the beauty of a phaeton, coupé, chariotee, or other vehicle in which such spring is used.

A carriage thus built is easier riding than one furnished with the elliptic spring, and works comparatively without friction. In a chariotee these springs are clipped with the shaft to the axletree—a combination which is also patented—and this makes a two-wheeled vehicle in which the rider does not experience any jolting from the motion of the horse. In the spring and gearing on the coupé shown the draught is from the axle and king bolt; there is no strain from the top of the spring, but it is all from the end, the springs being clipped to the axletrees without reach or connectings rods between axletrees. These springs are cheap, light, and simple of construction.

Further particulars may be obtained by addressing C. M. Murch, patentee, 278 and 280 West Sixth Street, Cincinnati, Ohio.



COUPÉ WITH MURCH'S NEW SPRING GEARING.

Explosive Waves.

Berthelot and Vieille have investigated the enormous living force and pressure which are propagated in explosive waves by the change of chemical constitution. They observed in the oxyhydric mixture a velocity of 2,841 meters, while that of the sonorous wave is only 514 meters. With the oxycarbonic mixture the velocity of the explosive wave is 1,089 meters, while that of the sonorous wave is only 328 meters. The explosion produces a single and characteristic wave; but the sonorous phenomenon is due to a periodic succession of waves. The excess of *vis viva* communicated to the gaseous molecules by the act of chemical combination represents the precise amount of heat which is set free in the reaction. The explosive wave is propagated uniformly, and its velocity is independent of the pressure, as well as of the material and diameter of the tubes, above a certain limit. The velocity constitutes, for each inflammable mixture, a true specific constant, the knowledge of which possesses great interest, in view of the theory of gaseous movements as well as its applications in the use of explosive materials. The conclusions of the research are applicable not only to mixtures of explosive gases but also to solid and liquid explosive systems, provided they are wholly or partially transformed into gas at the moment of explosion.—*Ann. de Chim. et de Phys.*

WAGON RUNNING GEAR.

The wagon is constructed with upright frames, which are attached to the ends of the sand boards, and are connected with the axles by braces to support the body and platform of the wagon. The rear longitudinal upper bars are made with forward extensions, to give a firm support to the wagon body, and are connected by cross bars. The rear part of the wagon body is attached to these side and cross bars.

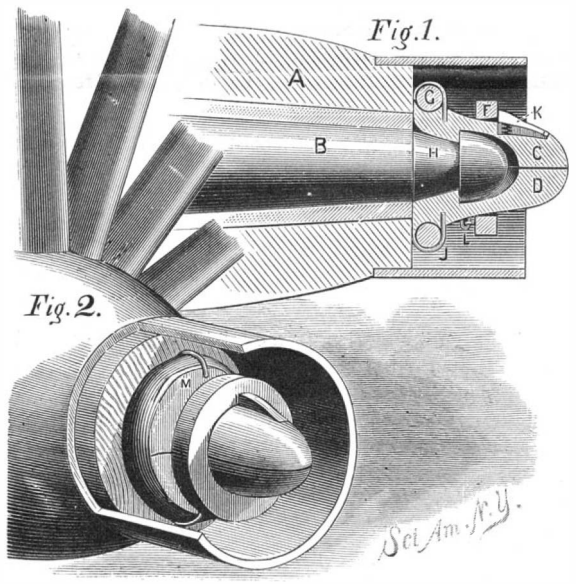
To the front upright frames are attached platform bars, which have secured to their lower sides a plate strengthened in place by inclined braces. This plate carries grooved blocks upon which rest rounded blocks attached to a plate upon which the fifth wheel is supported. The several parts are fastened together by a jointed king bolt having its pivot extended so as to serve as a pivot to the rocking frames. Rounded or convex bars, attached to the lower side of the plate or frame which serves as the movable part of the fifth wheel, allow the plate to rock as the wheels pass over uneven ground. The king bolt is made in two parts jointed to each other at their adjacent ends by a rod passing through the ends and through the rounded bars, so that the forward part of the running gear and the parts of the king bolt will rock upon the same axis. The method of attaching the tongue is clearly indicated in the engraving. This construction enables the forward and rear part of the running gear to rock in passing over uneven ground independently of each other and without twisting or straining the wagon body, or any part of the running gear. The wagon can be turned in a very small space, as the forward wheels readily pass beneath the body.

This invention has been patented by Mr. W. H. Fanning, of Lapeer, Mich.

FANNING'S WAGON RUNNING GEAR.

HUB ATTACHING DEVICE.

Figure 1 is a longitudinal section and Fig. 2 a perspective view, with part broken away, of a simple and effective device for securing wheels upon their axles, recently patented by Mr. G. H. Hombach, of St. Ignace, Mich. The outer end of the axle, instead of being provided with a screw thread and a nut in the usual way, is formed of a tapering portion, H, and a rounded head having a square shoulder forming with the part, H, an annular groove. A tapering cap divided into two parts, C D, has a recess in its inner end to receive the end of the axle. An annular ridge projects into the groove in the axle. In the outer surface of the cap, at its inner end, is a groove in which fits a metal ring, G, to which the cap sections are united by suitable hinges. The inner lower corners of the section, C, are cut away to permit the section to swing open over the part, H, of the axle on the ring as a center. The sections are kept within the ring by top and bottom projections passing behind the ring.



HOMBACH'S HUB ATTACHING DEVICE.

After the wheel has been placed upon the axle, the ring, G, with the lower cap section held in place within it, is passed over the end of the axle; the upper section is then swung down over the lower section and under the ring. The ring, F, which is attached to the lower section by the hinge, L, is swung over the tapering end of the cap, holding the sections securely together, and is retained in place by the spring catch, K. The engagement of the annular ridge with the groove in the axle holds the cap on.

The Cost of a Lead Pencil.

"What does it cost to make a lead pencil?" queried a reporter of the New York *Sun*. "First let me tell you how we make a pencil," said the manufacturer. "See this fine black powder? That's graphite. It costs twenty-five cents a pound. This white substance is German clay. It comes across the ocean as ballast in sailing vessels, and all it costs us is freight. We mix this clay and this powder together and grind them in a mill, allowing moisture to be added during the process, until the two are thoroughly assimilated and are reduced to a paste about the consistency of putty.

"This paste we press into these dies, each one of which is the size of a pencil lead, except in length. There are four leads in one of these. After they are pressed we cut them into the proper length, and bake them in an oven kept at very high heat. There we have the lead made. Its hardness is regulated by the greater or less amount of clay we mix with the graphite—the more clay we put in, the harder the lead.

"The cedar we use comes principally from the swamps of Florida, and is obtained entirely from the fallen trees that lie there. The wood is delivered to us in blocks sawed to pencil lengths, some thick, to receive the lead, and others thin, for the piece that is glued over the lead. The blocks are sawed for four pencils each. They are grooved by a saw, the groove being the place where the lead is to lie.

"The leads are kept in hot glue, and are placed in the grooves as the blocks are ready. When that is done, the thin block is glued fast to the thick one. When dry, the blocks are run through a machine that cuts the pencils apart. Then they are run through a machine that shapes and burnishes them, and they are ready to be tied in bunches, boxed, and put out.

"The different grades in value are made by finer manipulation of the graphite. Here is a pencil that is about the average quality used in every-day business. It costs a little more than one-quarter of a cent to get it ready for market. We sell it to dealers at one hundred per cent profit, and the dealer makes much more than that. Of this grade an operator and the machinery will easily make 2,500 a day."

Visit of the British Association.

During the discussion in the Dominion House of Commons upon the vote of $25,000, to defray the expenses of the meeting in Montreal in August next of the British Association, some further arrangements for the reception of members were made known. The excursion to the Rocky Mountains will, it is announced, take place on September 4, the members being taken by the New Canadian Pacific Lake Route, where specially constructed steamers make direct connection with the railway on each side. The excursion will probably occupy two weeks, and arrangements have been made that members of the party may not be put to greater expense than one dollar and a half per diem during the trip. Of the $25,000 granted by the Dominion Parliament, $5,000 will be used to defray the expenses of the meeting itself, and a fund is being raised to guarantee the Association against loss in connection with the publication of their proceedings. In addition to the Rocky Mountains excursion, others will be arranged to Ottawa, Quebec, and probably to Belœil Mountain, a locality of great geological interest. Active preparations are being made at Montreal, Toronto, and other places which will be visited, to give the members a due reception. It has also been arranged by the Associated Atlantic Cable Company that social cable messages to and from the delegates and their friends shall be sent free of charge. This is regarded as a considerable contribution toward the success of the meeting in Montreal.

Vincenti's Modification of the Bobbins of Electro Magnets.

The ordinary bobbins are replaced by a thin sheet of copper, whose width is equal to the length of the arms of the magnet, and the successive layers of sheet copper are insulated with gum lac and silk ribbon. A maximum magnetic effect is obtained when the number of revolutions is such that the resistance of the band is to the external resistance as the thickness of the uncovered band is to that of the insulated one.

In order to obtain the best results, Müller's rule must be conformed to, that is to say, the diameter of the core must be equal to the thickness of the magnetizing bobbin (in which case the resistance of the latter will be equal to twice the external resistance), and the length of each arm of the magnet must be six times greater than its diameter.—*La Lumière Electrique.*

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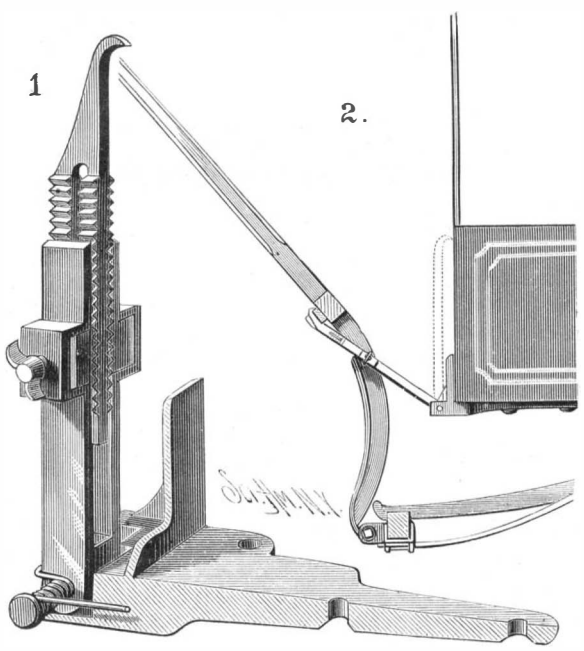
SHAFT SUPPORT.

The invention herewith illustrated was patented by Mr. James F. Pace, of Arcadia, La., and consists in a bar pivoted to the front of the vehicle and forced upward by a spring so as to press against the cross bar of the shafts and hold them raised. Near one end of the plate screwed to the bottom of the box is a standard adapted to be fastened to the dashboard. At the front end of the plate is a recess to receive the end of a fork, which is held in place by a bolt around which a powerful spring is coiled. The spring passes under and forces the fork upward, and its ends are secured in

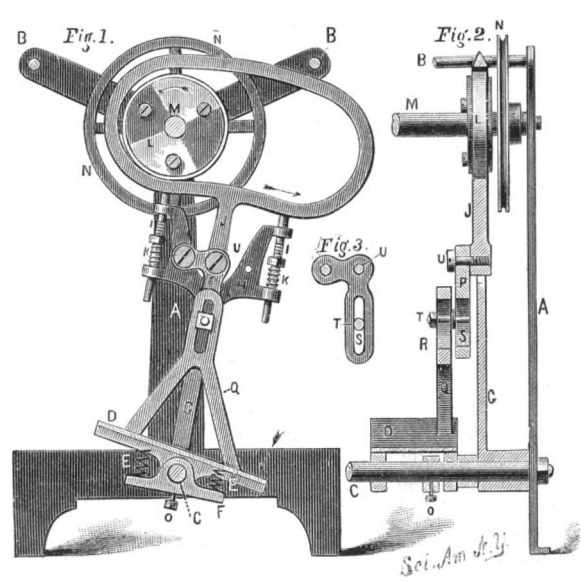


PACE'S SHAFT SUPPORT.

the plate. Each shank of the fork (shown enlarged in Fig. 1) is provided with a bend which forms a recess to receive clamp plates whose adjoining surfaces are transversely serrated. A right and left hand screw is held to turn in the bends, and is passed through the plates and through a longitudinally slotted bar, both sides of which are serrated. On the free end of this bar is an upwardly projecting hook, which enters a notched plate on the under side of the cross bar of the shafts. The bar is adjusted until its hook can pass into the notch, when it is clamped and held firmly between the serrated plates. The bar and fork are swung down, the shafts raised, and the hook passed into the notch; the fork and bar are pressed upward by the spring, and the shafts are held in a raised position. The dotted lines in Fig. 2 show the position of the fork and bar when not in use.

FOOT POWER.

Our engraving shows an improved foot power, to be used in place of the usual treadle crank and connecting rod for operating machinery by foot. The standard, A, united by top rods, B, and a bottom central shaft, C, form a frame. Rocking upon the shaft is a foot plate, D, whose ends are pressed upward by spiral springs held between the plate and a cross bar, F, held on the shaft by a binding screw by which the bar may be adjusted according to the inclination of the plate in its normal position. An upwardly projecting bar, G, is loosely mounted at its lower end on the shaft, and has a fork formed on its upper end, from the outer edge of each prong of which apertured lugs project. Through these lugs pass rods, K, projecting downward from the bottom



FIELD'S FOOT POWER.

of a curved frame, in the opening of which a friction wheel, L, having a rubber ring is located, and which is mounted on the driving shaft.

The diameter of the wheel is a little less than the opening in the frame. Spiral springs, surrounding the rods, K, are held between the lower lugs and nuts on the rods, and press the frame upward. From the bottom bar of the frame projects an arm, J, whose end is pivoted to the angle of an elbow lever, P. The upper arm of this lever is pivoted to one of the prongs of the fork, H, and the other arm is furnished with a longitudinal slot, S (Fig. 2), through which and the slot in the standard, Q, passes a pintle by which the pressure upon the wheel, L, can be regulated.

When the lower end of the foot plate is depressed, the swinging part of the device is moved in the direction of the middle arrow, and the standard, Q, which is independent of the arm, G, swings the lower end of the elbow lever in the direction of the arrow, thereby raising the curved frame and bringing its bottom bar in contact with the rim of the wheel, L, which is revolved in the direction of its arrow. When the opposite end of the foot plate is depressed, the swinging part is moved in the contrary direction, the angle lever is moved downward and also the frame, thereby bringing the top bar in contact with the rim of the wheel. The motion can be reversed by pivoting the angle lever to the other prong of the fork.

This invention has been patented by Mr. Henry Field, Jr., of New Bedford, Mass.

Natural Gas for Glass Making.

In the vicinity of Pittsburg, Pa., the use of gas drawn from the gas wells has been applied in the manufacture of glass. The *Glassware Reporter* says:

"It seems to us that the advantages of natural gas in the manufacture of glass are liable to be exaggerated, especially in so far as they act as an incitement to investors to erect factories in remote and inaccessible places, solely on the strength of the gas supply alone. To those who have any intention of going into the glass business on such grounds, we desire to say that the idea that cheap fuel is a considerable factor of success in the pursuit of glass making is a mistaken one. On a fair average, even if fuel were to be had for nothing, such an advantage would amount to only about five or six per cent of the total cost of operating a factory. This advantage is more than offset (in the case of factories started in the outlying districts) by the drawback of remoteness from market, and the lack of many conveniences, which can only be promptly had in the largely manufacturing centers. Take Pittsburg here for example; if a manufacturer breaks a shaft, or a driving belt, or other machinery, he can have men at work on repairs in half an hour from the time of the accident, whereas in country places such a mishap might necessitate his shutting down for a day, or even two or three. Of course, the places in the immediate vicinity of Pittsburg enjoy equal facilities with that city itself, but we have reference principally to more remote districts.

"With regard to this gas itself, its great unreliability and unsteadiness of pressure make it a very inconvenient fuel to use at times, and the saving of labor which was promised to result from its use has not been made manifest so far, for the men that attended the fires when coal was used have now to look after the gas, and see that its pressure is uniform and regular. We do not wish to be understood as underestimating or seeking to depreciate the value of this fuel, for it is undoubtedly very valuable, but there are many improvements necessary in the methods of its transmission from the wells to the consumer that must be adopted before it will so greatly surpass coal in cheapness and efficiency as to cause any perceptible cheapening in the cost of producing glass. We know one manufacturer, outside of Pittsburg, who has used natural gas largely, and as the result of his experience he expresses a wish that he had never seen it, so much trouble and inconvenience did it cause him. The gas industry (if so it may be called) is, however, young yet, and, like all new things, works crudely and unsatisfactorily at first, but doubtless improvements in the methods of application, control, and other particulars will be made, which will eliminate all or most of its disadvantages, and bring it to the front as an important adjunct to our manufacturing industries. It is cleanly, easily applied, and leaves no residue of dust or ashes, all of which are great advantages, but intending manufacturers who imagine that because they have an abundance of fuel they have everything, will not find this belief corroborated by actual experience."

IMPROVED JOURNAL BEARING.

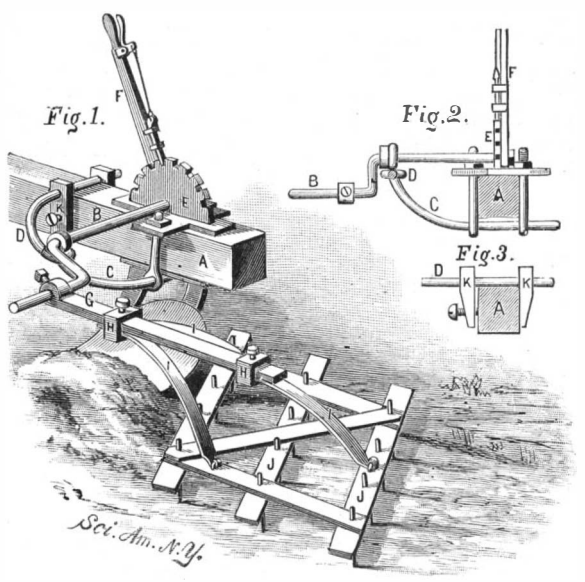
In the journal bearing shown in the accompanying engraving the block may be tightened up from time to time, as the bearing wears away, without disturbing the cap, and the box is secured to the bed frame by the same bolts that are employed to hold the cap permanently in place. Fig. 2 is a plan view, Fig. 1 a sectional elevation parallel to the journal, and Fig. 3 a section perpendicular to the journal. The bearing block, C, is fitted in a cavity in the cap, through the top of which pass adjusting screws, E, provided with jam nut, F, so that any wear may be taken up. This construction permits of extending the bolts, J, through both the cap and box to the frame. Lateral play of the block, C, is prevented by one or more set screws, K, which pass through one side of the cap and press the block against narrow faced ribs in the opposite wall of the cap, the block being provided with corresponding ribs. These ribs and the screw insure the proper lining of the block with the journal, and the latter effectually prevents side play of the block. The manner of oiling the journal is clearly indicated in the cut.

This invention has been patented by Mr. J. M. Elliott, of Winnsborough, S. C.

COMBINED PLOW AND HARROW.

In the combined plow and harrow lately patented by Mr. E. O. Long, of Hayesville, O., the plow beam and harrow are connected by a crank rod, a connecting rod, and a set of springs—the crank rod being secured to the plow beam and held against the draught strain of the harrow by braces, and the springs and connecting rod being so connected by bands and set screws that the harrow can be readily adjusted.

The rod, B, works in bearings formed upon a plate attached to the beam by bolts, and also upon the brace, C, which passes through the eyes of the bolts at the lower side of the beam. The arrangement of these parts is plainly shown in the sectional view, Fig. 2. The curved brace, D,



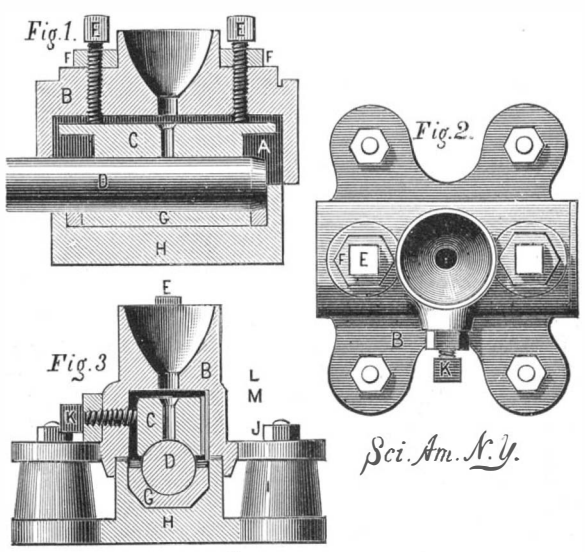
LONG'S COMBINED PLOW AND HARROW.

has an eye formed in its outer end through which the brace, C, passes, and at its other end is provided with two arms, K (Fig. 3), by which it is clamped to the beam, as indicated. The outer part of the rod, B, is bent into crank form and passed through an eye in the forward end of the bar, G, which is held in place by a set screw. To the bar, G, at a little distance from the rod, are secured by a band and set screw the forward ends of two springs, I, whose other ends are attached to the forward part of the harrow. A third spring is secured to the bar, G, and to the middle of the rear part of the harrow. The harrow frame is strengthened by one or more braces, and is provided with teeth in the ordinary manner.

With this construction the crank rod can be readily attached or detached from the plow beam, and the harrow can be adjusted nearer to or further from the beam, as may be required. The springs hold the harrow down to its work and allow it to rise in case it strikes an obstruction. The crank shape of the rod allows it to be adjusted to a plow beam of any height. The inner end of the rod is made eight square, and to it is fitted the detachable lever, F, which moves along the side of a catch plate, E, provided with notches which engage with a pawl sliding in keepers on the lever. By moving the lever the harrow can be raised to allow it to pass obstructions and when turning round at the end of the furrow.

A Prehistoric Human Tooth.

The annual report of the Peabody Museum chronicles the finding of a human molar tooth, by Dr. C. C. Abbot, in the



ELLIOTT'S IMPROVED JOURNAL BEARING.

gravels near Trenton, affording paleolithic implements. It is a rolled and worn tooth, and is therefore of the same age as the implements. Dr. Putnam, Curator of the Museum, says that the discovery of the tooth removes the little doubt there was about the gravel bed origin of the portion of a human skull obtained some years ago at Trenton by Dr. Abbot from a person who stated that it was found in the gravel.

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Plant Culture in Moss.

A novel feature, and one that attracted some attention at the recent Regent's Park show, was some baskets of plants said to have been grown in prepared moss and entirely without soil. The exhibitor was Captain Halford Thompson, who claims to have discovered a new method of thus growing plants. Some time ago a Frenchman of the name of Dumesnil patented a kind of fertilizing moss for the purpose of growing plants without soil. With this production of M. Dumesnil, Captain Thompson states that he made several experiments, which resulted in his considering it open to serious objections, and was by no means certain in its results. These defects Captain Thompson has endeavored to remedy in a new preparation with which he has experimented, and by means of which he states he produced the luxuriant plants which he exhibited on Wednesday. Having found that by Dumesnil's moss it was quite possible to grow plants without soil, he set to work to prepare a fertilizing substance which would enable plants to be grown in it without the precautions necessary in using Dumesnil's moss, and he thinks that he has been perfectly successful in his endeavors.

He states that "plants in full bloom can be taken out of the ground or out of pots, and after all the earth has been carefully washed off, planted in moss which has been previously prepared with fertilizing fiber. They never even flag, but grow more luxuriantly than in soil." The plants shown by Captain Thompson fully bore out his statement, for it would be difficult to imagine more luxuriant plants than those he showed. They consisted of tuberoses, begonias, variegated vitis, gardenias, fuchsias, tradescantias, and others. All were furnished with healthy foliage, and were for the most part carrying flowers. The advantages of this method are stated by the inventor to be two-fold; first, the extreme lightness of a number of plants when grown together in one basket; another is the portability, an advantage which renders plants grown in this way particularly suitable for the embellishment of rooms and windows. No doubt to those who live in towns, where potting soil is not easily procured, this moss would be a special boon, on account of its lightness, portability, and cleanliness; but in the country, where mould is readily obtained, it would probably be less trouble to grow plants in the usual way, and we presume that Captain Thompson's invention commends itself to townspeople. In a small pamphlet the method of applying this moss is explained as follows:

"Take the plants you wish to put into the basket, carefully wash off all earth from the roots with tepid water, taking care not to injure the roots in doing so; then plant them in the ordinary way in the moss, which should be previously well wetted; if possible, keep the basket in a warm place free from draught for three or four days. The plants can, if wished, be transplanted from earth when in full bloom; they will not feel the check. After two months the upper layer of moss should be removed, and a similar quantity of my moss put in its place. If selaginella is grown on the surface of the moss (as in some of the baskets shown before the Botanical Society), it should be carefully removed first and replaced after the moss has been changed. The baskets do not require watering oftener than plants grown in earth do. The weight of the baskets will show if they want water."—*The Garden.*

Burning of the Dead.

The body burns, whether placed in the earth or fire; in one case it takes 10 to 20 years, and in the other so many minutes. Cremation is the proper and scientific way to dispose of dead organic matter. When the body is cremated, there is no further fear from disease germs in the body. The only plausible objection which has been offered against cremation is that in case of homicide through the administration of deadly poisons valuable evidence might be destroyed; but this is not a serious objection in the face of the many advantages gained. All innovations in sanitary science have had to fight their way inch by inch. Vaccination had a hard struggle, but came out triumphant, and so we predict for cremation a glorious victory, a triumph of good sense and science.—*Ionia Sentinel.*

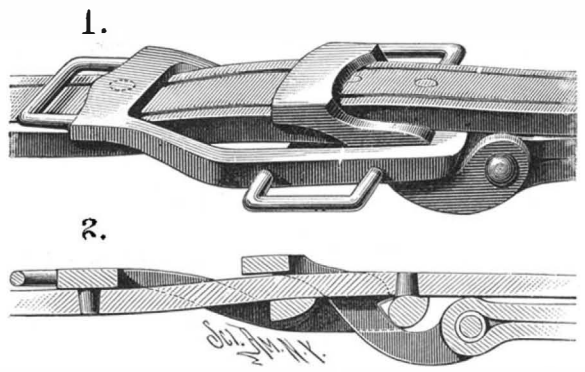
Selling Eggs by Weight.

There seems to be no good reason why the general practice of selling eggs by the dozen should not be superseded by the more rational one of selling them by weight. There is from twenty to thirty per cent difference in weight of eggs, yet the custom is almost universal in the Eastern markets of selling them by the dozen at a uniform price. Even ducks' eggs, which are much larger and regarded by some as richer, bring no more than the smallest hens' eggs of not half the weight. In California, eggs, fruits, and many other articles that are here sold by the dozen, the bunch, or by measure, are sold by weight. The practice, says the *American Agriculturist*, is a good one, and works beneficially for all parties, especially for the producer. It operates as a premium upon the cultivation of the most productive varieties of fruits, vegetables, and farm stock. The farmer who is painstaking with his poultry and gets the largest weight in eggs has a fair reward for his skill and industry. The present custom is a premium to light weight and good layers. We need a change in the interest of fair dealing in trade, and if necessary it should be enforced by legislation. If the Legislature is competent to fix the weight of a bushel of corn or potatoes, it can easily regulate the weight of a dozen of eggs, and thus promote exact justice between buyer and seller.

While this would to a certain extent be a more equitable arrangement, it is, nevertheless, wrong in principle, from the fact that the weights of eggs do not vary directly as their diameters, but as the cubes thereof, and unless the price were graded in the same ratio the system would not be an equitable one. Taken altogether, there seems to be no more just or simple way than selling eggs by weight.

TRACE BUCKLE.

The main part of the buckle is made in skeleton form and of considerable length, with end and center cross bars, and is curved outward at its rear end to permit the tug to pass under the first cross bar and over the others. The end cross bars are provided with tongues, which project in opposite



BAUDER'S TRACE BUCKLE.

directions, as shown in Fig. 2, and which pass through suitable holes made in the tug. The forward part of the buckle —termed by the inventor the "grip loop"—is attached to the hame tug by a bolt, and the side bars of the loop are bent so as to pass up through the main part between the cross bars, and allow the tug to pass through it under its cross bar. The outer edges of the sides of the loop are formed with notches, which receive the lips formed upon the edge of the end cross bars, thus fulcruming the loop so that its cross bar will grip the tug upon the center cross bar of the main part of the buckle. The notches and lips also serve to always maintain the proper relative positions of the main parts of the buckle, and to prevent the tug from being injuriously compressed and worn by the bar of the loop. Constructed in this manner the buckle is very durable and easy on the tug, which is readily adjusted.

This invention has been patented by Mr. C. C. Bauder. Further information may be obtained by addressing Messrs. Bauder Bros., at either Sanborn, Dakota, or Burnside, Ill.

UMBRELLA AND PARASOL FRAME.

The ribs are pivoted to a ring secured to the stick near the end. The braces, D, are pivoted to a sleeve sliding on the stick and to lugs on the ribs. This sleeve is not provided with the usual slot, and the stick has no spring catches. The outer ends of the braces are flattened, forked, and squared; and on each rib is soldered a semitubular forked piece, C (shown enlarged in Fig. 2), in such a way that one shank will be at each side of the lug. The opposite squared edges of the ends of the braces rest against the bottom edges of the spring shanks, H. When the umbrella is opened, the bottom edges of the shanks rest against the straight upper

CARRARA'S UMBRELLA AND PARASOL FRAME.

edges of the ends of the braces, and thus hold the various parts in place. When the umbrella is to be closed the sleeve is drawn down, thereby causing the upper ends of the braces to turn on the lugs; and when it is closed the opposite or upper edges of the flattened ends of the braces will rest against the spring shanks, and hold the parts in their new position. By this means a cheap, simple, and effective construction is secured.

This invention has been patented by Mr. Antonio Carrara, and additional particulars can be obtained by addressing Mr. Alfred Girardot, of 35 East Kinney Street, Newark, N. J.

The Deflection of Streams by Terrestrial Rotation.

The influence which the rotation of the earth exerts upon bodies on its surface, free to respond to it, has long directed the attention of scientists to discover whether streams in their course show any tendency from this cause to act more upon one bank than upon the other.

It was long ago perceived that rivers flowing to the north or to the south should by the rotation of the earth be thrown severally against their east or west banks. It is even many years since it was shown by Ferrel that these tendencies are but illustrations of a more general law, that all streams in the northern hemisphere are by terrestrial rotation pressed against their right banks, and all in the southern are pressed against their left banks, the degree of pressure being independent of the direction of flow. Yet the question of the sufficiency of the cause for the production of observable modifications in the topography of stream valleys is still an open one. A number of geologists have observed peculiarities of stream valleys which they referred to the operation of the law, while others have looked in vain for phenomenal evidence of its efficiency.

In an article appearing in the *Amer. Jour. of Science,* a writer asserts that he has finally obtained sufficient proof that such action does take place to an appreciable extent, notwithstanding the attempted demonstration by others that the cause is insufficient to effect any change in banks of a river, due to the increased pressure of the water. Due account must be taken to eliminate the effects of short curvatures in rivers, in obtaining results due to rotation, while a general curvature in the course of a valley through which the stream flows has the same tendency, though in a less degree, as does the curvature of a short bend, and this tendency must in many cases nullify and conceal the results of rotation.

Visible examples of the work of rotation are therefore to be sought especially in streams which, with courses in the main direct, are slowly deepening their valleys by the excavation of homogeneous material. The best locality known to the writer is the south side of Long Island, a plain of remarkable evenness, descending with gentle inclination from the morainic ridge of the interior to the Atlantic Ocean. It is crossed by a great number of small streams which have excavated shallow valleys in the homogeneous modified drift of the plain. Each of these little valleys is limited on the west or right side by a bluff from ten to twenty feet high, while its gentle slope on the left side merges imperceptibly with the general plain. The stream in each case follows closely the bluff at the right. There seems to be no room for reasonable doubt that these peculiar features are the result of terrestrial rotation. As the streams carve their valleys deeper, they are induced by rotation to excavate their right banks more than their left, gradually shifting their positions to the right and maintaining stream cliffs on that side only.

New Zealand Grapes.

There is one kind of fruit that does not grow well in New Zealand, in spite of everything said to the contrary, and that is the grape. It is true enough that grapes are often grown to perfection under glass in many parts of the colony, but they do not grow well in the open air. All the vineyards planted here within the last ten years have resulted in either partial or total failure. In certain localities, it is true, the vine has been cultivated successfully in the open air; but it was under exceptional circumstances and in favorable or sheltered situations. The vine requires heat in the summer to ripen the fruit, and cold in the winter to ripen the wood; but unfortunately the New Zealand climate is without these characteristics, and, moreover, it is so moist or humid that it promotes too much activity in the growth of the vine in the winter, and in the summer the fruit is almost certain, during the process of ripening, to become mildewed. The rainfall is perhaps not too heavy to interfere with the growth of the grape, but it rains on too many days in the year. The chief obstacle, however, in the way of vine culture in New Zealand is the absence of the extremes of heat and cold. The result is that nearly all the grapes found in the market are either imported or grown under glass. Under these circumstances, it is not surprising that this delicious fruit always commands a high price in New Zealand.

New Discoveries in Italy.

M. Le Blant, the director of the School of France, at Rome, has forwarded a communication to the Academie des Instructions, stating that the excavations recently made at Subiaco have brought to light some splendid statues, which appear to have been sent by the Emperor Nero from Rome, for the decoration of his villa in that vicinity. A chamber has been also discovered, hung around with tablets upon which are portraits, in basso-rilievo, of celebrated authors, and probably this room served as a library. But the most important finds have been made near Marino, about 15 kilometers from Rome. The workmen have cleared out chambers adorned with mosaics and variegated marbles, as well as a vast courtyard encircled by a colonnade and long galleries communicating one with the other to various parts of the villa. These covered passages are filled with priceless sculptures, statues, and bassi-rilievi of various designs. Leaden pipes, bearing the imprint of the genitive names of Messalina and Voconius Pollo, probably successive owners of the villa in question, have been also brought to view.

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Correspondence.

An Invention Wanted.

To the Editor of the Scientific American:

A serious accident in this city, this afternoon, from blasting rock, in excavating for the foundation of a new building, suggests the query whether some safer method than blasting may not be invented, for excavating in thickly populated cities. As crosscut saws are used for sawing stone in the yards, it occurred to me that *circular saws*, with both horizontal and perpendicular movements, might be used for cutting stone in its native bed, into small cubes, which might be used for building purposes.

As similar accidents are following each other so rapidly in different parts of the country, it becomes philanthropists to agitate the subject, while it would probably pay inventors to consider it from a practical standpoint of view. Some practicable invention is evidently needed for such excavations, and there ought to be inventive genius enough in the nineteenth century to produce it.

ROBERT SINNICKSON.

Trenton, New Jersey, June 13, 1884.

Distances of the Fixed Stars.

Mr. David Gill, F.R.S., H. M. Astronomer at the Cape, recently lectured at the Royal Institution on "Recent Researches on the Distances of the Fixed Stars, and Some Future Problems in Sidereal Astronomy." Lord Rosse occupied the chair. Mr. Gill said that the study of sidereal astronomy is specially fascinating; we look upon the galaxies and suns which surround us, and wish to learn whence we come and whither we are drifting in the realms of space, and what is the position of our own sun in the concourse of the stars. Are the nebulæ ever to retain their ghost-like forms, or are they condensing into suns? The discoveries of the past show that "art is long and life is short," and that in the long run careful observations are superior to the most brilliant speculations. He would not, however, undervalue the imaginative mind which seeks after truth, for without it no man is fitted for the work to be done, or can be sustained during the watches of the night in his noble labor of love.

Before 1832 the parallax of no fixed star had been rendered sensible, and by regular observations between November, 1835, and August, 1838, it was discovered that α Lyræ had a parallax of one-quarter second of arc, a point as difficult to determine as the measurement of a globe one foot in diameter at a distance of eighty miles. He also stated that a silver threepenny piece a mile off would represent the size of the orbit of the earth as seen from 61 Cygni. These early measurements were taken by ascertaining the changes of position of certain stars in relation to each other, but the first to make a direct measurement of their parallax was Henderson, of the Cape Observatory; the second was Bessel. Of late years he—Mr. Gill—and a young American astronomer, Dr. Elkin, had been measuring the distances of some fixed stars in the southern hemisphere by means of a telescope with a divided object glass, and with the following results as expressed in the number of years in which light travels from them to the earth: α Centauri, 4·36 years; Sirius, 8·6; Lacaille (9352), 11·6; ε Indi, 15·0; O 2 Eridani, 19·0; ε Eridani, 23·0; ξ Tucanæ, 54·0. So far as observations have yet gone α Centauri is the nearest of the fixed stars, and eye observations as to the relative brilliancy of stars are no guide to their relative true distances. He believed, with Mr. Lockyer, that the future of astronomy depends much upon photography, especially since the recent feat of exquisitely photographing the nebula of Orion had been so efficiently accomplished. It would take ten years to make a complete photographic map of the heavens. Dr. Elkin was willing to do it in the northern hemisphere, and he—Mr. Gill—wished to do it in the southern hemisphere, if the necessary apparatus were supplied; this, from the kind consideration he had always received from the Lords of the Admiralty, he anticipated would be done. He concluded by quoting the words of Sir John Herschel, that such things are quite as worthy of struggles and sacrifices as many of the objects for which nations contend, and exhaust their physical and moral energies and resources. They are gems of real and durable glory in the diadems of princes, and conquests which, while they leave no tears behind them, are forever inalienable.

The Army Worm Again.

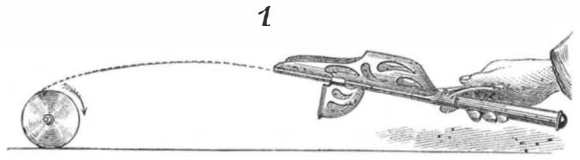
This troublesome pest, we see, has made its appearance in various places in New England, notably in Tolland County, Conn. A correspondent says the selectmen of Willington took measures at once to cut off the advance of the worms. A large number of men were called out, who hastily dug a trench partly about the field, but abandoned the attempt when they found that the adjoining lots and pastures were alive with the marching enemy. The army appears to be marching north, and detachments have been seen along the northern limit of the county.

In No. 306, SCIENTIFIC AMERICAN SUPPLEMENT, an illustration of the army worm and its mode of attack upon the fields is shown, and its life history, habits, and the best modes of extermination are given. This is a valuable paper to circulate among the farmers in the worm affected districts. Sent by mail on receipt of ten cents, or may be had at all news agencies.

A NOVEL TOY.

The handle of the toy is made hollow, and forms a guide for a rod, on the outer end of which is firmly secured a carrier for the wheel or projectile of the toy. Within the handle is a spring that serves, by its pressure on the rod, to impel the carrier to the position shown in Fig. 1. On the handle is fitted a trigger, so arranged that when the carrier and its rod are forced back against the pressure of the spring it will engage with the carrier to retain it in a locked position. The carrier is provided with clips which slide along ribs formed upon opposite sides of a channel-like guide extending outward from the handle. The wheel is mounted on a spindle, which enters recesses formed upon the opposite sides of the forward end of the carrier. On the spindle is a pinion which, when the wheel is set within the carrier, is in contact with a rail or rack on the guide. There may be a rack along each side, and also duplicate pinions. When the wheel is thrown out by the action of the spring, a very rapid positive revolving motion will be imparted to it by the gear. The toy may be used either for shooting and rotating the wheel in the air, or impelling and rotating it over the floor, or for spinning it as a top on its spindle, as shown in in Fig. 2. When the toy is held with the carrier below, as in Fig. 1,

1



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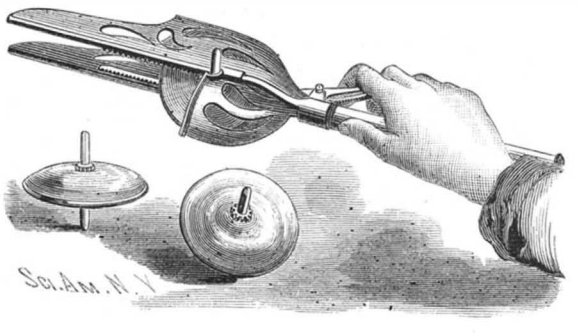

A NOVEL TOY.

the wheel will roll backward after it has overcome the inertia it received from the spring.

This invention has been patented by Mr. C. A. Volke, who may be addressed in care of Dr. R. Marctner, Stapleton, N. Y.

Wood Pavements.

At a recent meeting of the Institution of Civil Engineers, London, a paper read was on "Wood Pavement in the Metropolis," by Mr. George H. Stayton, C.E.

The author directed attention to the nature and extent of the various wood pavements in the metropolis, and to a comparison of the results obtained. The aggregate length of the streets of London was 1,966 miles, of which, excluding 248 miles in course of formation, 1,718 miles were thus maintained by various authorities, namely:

Macadam	573	miles.
Granite	280	"
Wood	53	"
Asphalt	13½	"
Flints or gravel	798½	"

The existing area of wood pavement was 980,533 square yards, and its estimated cost £600,000. Not more than 4·38 per cent was east of the city or south of the Thames. The method of construction adopted by the author was described and illustrated. His practice was to set out the levels of the channels so as to allow a rise to the crown of the road equivalent to 1 in 36 above the mean channel level. The inclinations of the channels should not exceed 1 in 150, and numerous street gullies should be provided. An extra cost of 4 per cent for gullies was money well spent. The foundation of the Chelsea pavements consisted of a bed of concrete 6 inches deep, composed of 5¼ parts of Thames ballast to 1 part of Portland cement; the entire cost for materials and labor when completed was 2s. 3½d. per square yard. The use of old broken granite as a substitute for Thames ballast, although cheaper, was not recommended. Concrete made from that material was less homogeneous than pure ballast concrete.

The greater part of the wood pavement in London was composed of rectangular blocks of yellow deal. Before adopting wood pavement the author inspected the various kinds of pavement then laid, and came to the conclusion that a plain but substantial system was the best. The blocks were 3 inches by 9 inches by 6 inches, and were specified to be cut from close and evenly grained, well seasoned and thoroughly bright and sound Swedish yellow deals (Gothenburg Thirds). The author knew of no more suitable wood in the market, which so satisfactorily stood the wear of traffic and atmospheric changes. Of hard woods, pitch pine took a high place in point of wear, the ascertained annual vertical wear of the section in King's road during four and a half years being 0·055 inch only. Neither elm nor oak blocks would withstand the atmospheric changes to which street surfaces were exposed; larch would probably take a high position, but the available supply was limited. In many pavements the blocks had been dipped in a creosote mixture; in a few instances they had been creosoted or mineralized, but at least one-third had been laid in their natural condition. The ordinary dipping process was of little value as a preservative, but might be utilized as an external discoloration for inferior blocks. The author had tried creosoted blocks, but experience had convinced him that they were not more durable than plain, that their surface was less clean, that the system was 20 per cent more costly, and that it tended to produce premature internal decay. The wood pavement in Chelsea required 40 and one-half blocks per square yard; they were laid upon the concrete in their natural state, with the fibers vertical, and with intervening spaces three-eighths inch wide. The joints were filled with cement grout composed of three parts of Thames sand to one part of Portland cement; they were kept parallel by means of three cast iron studs fixed in each block, which rendered the pavement firm and steady until the grout was thoroughly set. A top dressing of fine gritty material completed the work. If practicable, traffic should be excluded from a newly laid pavement for at least one week after completion. The result of five years' wear convinced the author that the plain system comprised all the essentials of a sound pavement; that it provided a quiet and smooth surface for vehicles, and safe foothold for horses; that the cement joint adhered to the wood, effectually resisted wet, did not unduly wear below the wood surface and thereby allow dirt to accumulate in the joints, neither did it displace the blocks. The net cost was 10s. 6d. per square yard, and but comparatively slight repairs had been found necessary. The blocks were originally 5·87 inches deep, but their present average depth was 5·22 inches in King's road, and 5·60 inches in Sloane street, their probable life being seven and eight years respectively.

Particulars of wood pavements in various parts of London were given at considerable length; and in those instances where the approximate weight of the traffic per yard width was known, the details of cost, maintenance, durability, ascertained vertical wear of wood, etc., were described.

The essentials of good management consisted in the prompt removal of defective blocks, the constant use of hand scrapers and brooms in removing horse droppings and mud, and the judicious application of water and sand. The cost of this service was 4½d. per square yard per annum, as as against 11d. per square yard for macadam previous to the substitution of wood. The author considered it undesirable to lay blocks of a greater depth than would provide for a life of seven years, as very few pavements retained a good surface after about six years' wear. Experience suggested that 5 inch blocks were preferable. Taking the life of the blocks in King's road at seven years, the first cost, repairs, renewals, and cleansing, spread over twenty years, amounted to 1s. 9d. per square yard per annum, and over fifteen years to 2s. 1¾d.

On the whole, the author submitted that wood pavement was economical and convenient, that notwithstanding many failures the modern system had achieved a fair amount of success, and that there was no apparent reason why its use should not be extended.

The paper included tables and statistics showing the first cost and annual cost of various wood pavements, the comparative vertical wear of wood in various streets as reduced to a traffic standard, together with the ascertained and estimated life of the blocks.

The Teeth of the Future.

In an able address recently delivered, Mr. Spence Bate, F.R.S., has drawn attention to some remarkable features which it may be interesting and instructive to take into account. In the teeth of the Esquimaux, the Red Indians, and the natives of Ashantee, as well as those found in the ancient barrows of England, the so-called interglobular spaces, seen so frequently in sections of modern teeth, appear not to exist; nor, indeed, are they to be detected in the dentine of the best developed structures of the modern European. Not only is the dentine getting deteriorated, but the enamel would seem likewise to be undergoing a modification—becoming too opaque. In addition to the histological changes, the external form and character of the teeth are sustaining an alteration. This seems to be in relation to an important feature in the history of their evolution.

The tendency for the cranium to develop at the expense of the face and the jaws is seen to occur as we ascend the scale of the vertebrated series of animals. Owing to this atrophy of the jaws, the proper space for the full play and development of the normal teeth would seem not to be available. At birth the bones are not sufficiently grown to receive the teeth in their normal arch; and, as in the human mouth the premaxillary bones are firmly united a short time after birth, it follows that the posterior part of the jaw is the only place where growth can occur. Any delay in the development and consolidation of the symphysis must have the effect of contracting the space required for the teeth at this site. In the course of vertebrate evolution there is a marked tendency for teeth to disappear. The lower vertebrates have four molars on each side in each jaw, the higher have three, while in man the number is reduced to two.—*The Lancet.*

[The inference is, the teeth are being gradually evolved into brain matter, and as man increases in intellect his masticators become unnecessary. The future man will have a large brain, but no natural teeth. He will have to depend on the mechanical dentist.]

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THE PANAMA CANAL.

Connected with an undertaking of such vast proportions as the Panama Canal, there is an amount of work expended on preliminaries before the real task is touched, the magnitude of which it is difficult to form any just conception of. It was necessary to make complete and accurate topographical surveys of the country for a considerable distance on each side of the route, and though much assistance was derived from the surveys of the engineers of the Panama Railroad, still the labor was by no means insignificant. The geological surveys that had been made previous to the past few years did not give that practical information which this project required, and were, consequently, of little or no use. The isthmus is covered by almost impenetrable forests, so that the nature of the soil can only be ascertained in isolated cases. If a few rocks were now and then visible, it was hard to say whether they were outcroppings or detached blocks, and, therefore, the nature of the underlying mass could not be judged from an examination of them. Borings upon the line of the canal, at frequent intervals, became necessary. The disastrous effect of the climate upon foreigners is well known. The comfort and health of the staff and men have been closely attended to, and a good share of the preliminary work was expended in the construction of buildings, barracks, offices, hospitals, etc.

The line of the canal is divided into sections, at each of which the work is being pushed forward in both directions. The American Dredging and Contracting Company has a contract for that portion lying between Colon and Gatum, a distance of nine kilometers. Work upon the other terminus between La Boca and Rio Grande is being done by the Franco American Trading Company. The greater part of the remainder of the work is being done by the canal company, only a small portion of it being under contract. Work is progressing at the following points,* the height of each of which above the level of the oceans is given: Dos Hermanas, 20 feet; Vamos-Vamos, 25; Buhio Soldado (between this and the next point the land rises to a height of 165 feet); Buena Vista, 56; Frijole, 44; Tabernilla, 53; Barbacoas, 46; San Pablo, 104; Mamei, 79; Gorgona, 66; Matachin, 75 to 168; Bas Obispo, 100 to 236; Emperador, 228; Culebra, 333; Paraiso, 145; Pedro Miguel, 20; Miraflores, 36. The total amount of material to be dealt with is:

	Cubic meters.
Dredging	26,913,000
Rock, hard and soft	37,632,000
Earthwork	41,295,000

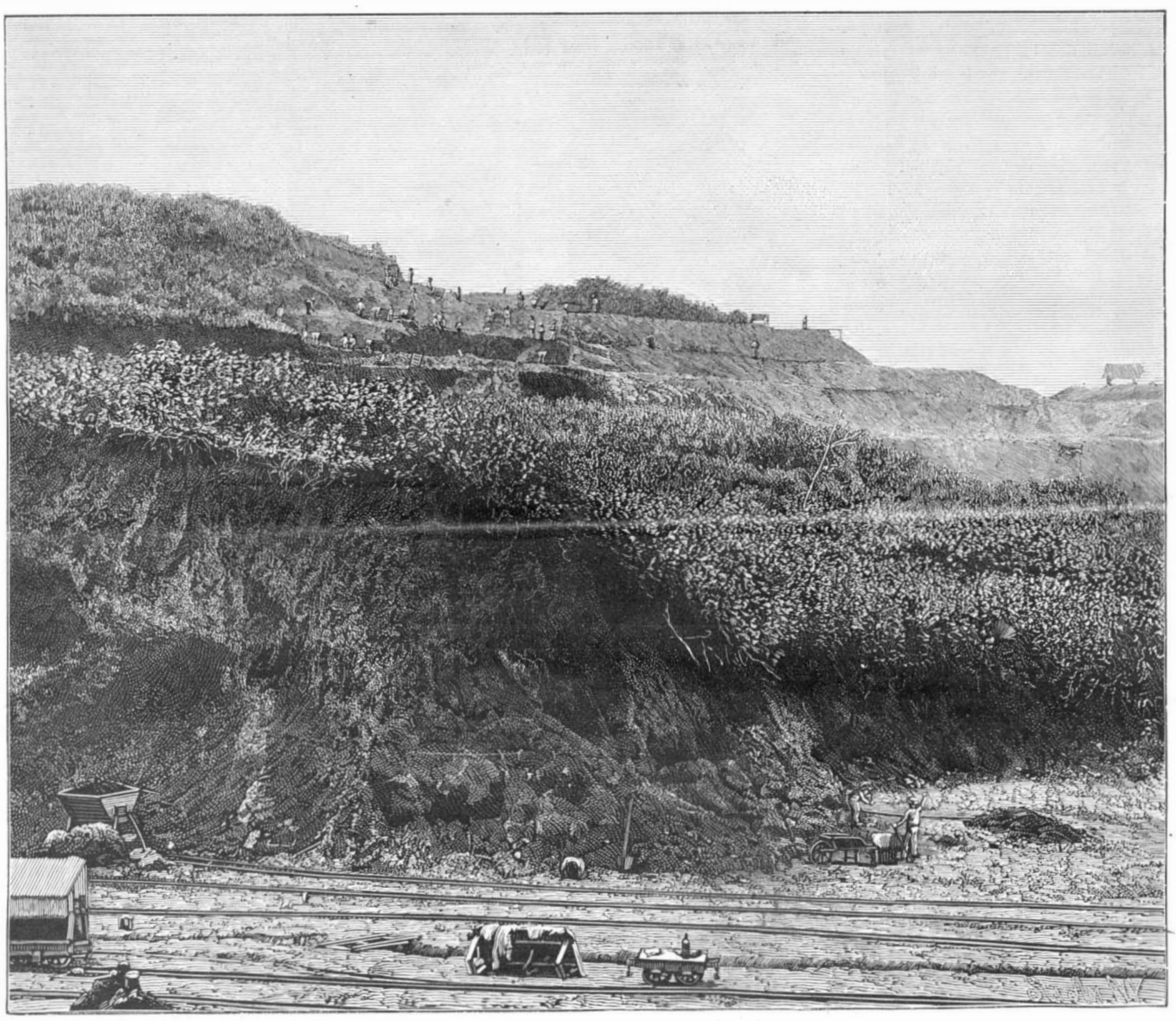
The amount of material removed up to March 1 last was:

	Cubic meters.
Dredging	452,000
Rock, hard and soft	752,000
Earthwork	2,967,000

The severe climate has prevented the employment of as many men as could be worked advantageously, and has forced the company to substitute black for white labor. Although the sanatory regulations are enforced as rigorously as possible, it is not in the power of any company to make a negro—such as are found upon the isthmus—obey rules which he will not understand, and which interfere with his present comfort. The natural result of his disobedience is that he is soon placed on the sick list, and sent to the hospital. During the dry season of the past year there were about 12,000 men employed on the excavations, but during the wet months, when operations in many parts of the line are suspended, only from 6,000 to 8,000 men are at work.

Machinery and supplies are delivered at Aspinwall, and distributed along the line of the canal by the railroad, which is also used to remove the excavated material. The proper disposal of this material makes one of the large items of expense, since it must not only be taken away from the canal, but must be so placed that the heavy rains will not wash it back after the completion of the work.

The manner of carrying on the work and the appliances used will be readily understood from our engravings. The "discharger" is used in connection with a marine dredge having a capacity of 6,500 cubic yards per day, and a scow, which are now working in the bay at Aspinwall. Through a hole in the center of the hull of the dredge extends a powerful frame carrying an endless chain to which iron buckets are attached. The excavated material is dumped into a chute leading over the side of the dredge, and whose outer end can be raised and lowered. The scow is towed alongside, and secured so as to receive the material falling from the chute; after having been loaded it is taken to the discharger —a name which well explains its duties. This is built upon the catamaran plan, and consists of two long hulls, secured together by overhead frames, and between which the loaded scow is placed. The material is elevated by buckets upon an endless chain carried upon a frame, the lower end of which can be raised and lowered by a chain passing through a block in the upper part of the cross frame. The material is emptied into a long iron tube, three feet in diameter, and supported by guys from a mast, as clearly shown in the engraving. Water is pumped into the tube in order to assist the discharge.



LOWER OBISPO —VIEW SHOWING THE MANNER OF EXCAVATING THE PANAMA CANAL.

For work of this kind, where it is impossible to ascertain the exact nature of the material to be excavated, and where obstructions in the form of bowlders, stumps, etc., are being constantly and unexpectedly encountered, it is doubtful if this method of digging be as rapid and economical as that which uses the ordinary dipper and grapple. An obstacle of unusual size lying in the path of the buckets will obstruct operations, and there is no way of raising it. Besides, such obstacles, if raised, are apt to choke the delivery tube.

We show views of two excavators, one of American and the other of French make. The first was photographed as at work at Culebra, the other working at Emperador. Both are built entirely of iron, but they differ in plan. Each is mounted on a truck running upon a track, and each dumps into cars run upon a track alongside. In the American excavator the lower end of the boom is swiveled, and the upper end is connected to the top of the mast. Chains lead from the drum up the sides of the boom to the top, where they pass over sheaves, from which they are taken around sheaves on the yoke of the dipper, and then secured to the end of the boom. A wide sweep is given to the dipper, and all the movements of which the machine is capable are easily and rapidly effected by the engineer.

The French excavator somewhat resembles, in plan, the dredge just described. An endless chain provided with buckets passes over pulleys, one set of which is journaled in the upper part of a frame, and is driven by gearing connecting with the engine; the other set is journaled in the lower end of the frame, which has a vertical and horizontal movement. The lower end of the pulley frame is supported, and also raised and lowered, by chains passing from a drum over sheaves in the upper end of a frame hinged to the side of the platform. The excavated material is dumped into a chute, upon the opposite side of the platform, which discharges it into the car.

The method of working where the cut is deep is clearly shown in our view of Lower Obispo. The slopes are divided into terraces, upon each of which a track for the dirt cars is laid. The laborers upon each step work toward the hill, the track being moved inward as required. From this engraving a good idea may be obtained of the great magnitude of the work, and some conception may be formed of the task before the engineers, and of the amount of work that will have to be done before the cut at Culebra—some 825 feet across the top and 330 feet deep—will have been completed.

* In the SCIENTIFIC AMERICAN SUPPLEMENT, No. 367, we published a map of the Isthmus of Panama, showing the line of the canal as finally located.

Stopping a Cattle Stampede.

"One of the smartest things I ever saw in my travels," said a passenger from the West, to a newspaper reporter, "was a cowboy stopping a cattle stampede. A herd of about six or eight hundred had got frightened at something, and broke away pell mell with their tails in the air and the bulls at the head of the procession. But Mr. Cowboy didn't get excited at all when he saw the herd was going for a straight bluff, where they would certainly tumble down into the canyon and be killed.

"You know that when a herd like that gets to going, they can't stop, no matter whether they rush to death or not. Those in the rear crowd those ahead, and away they go. I wouldn't have given a dollar a head for the herd; but the cowboy spurred up his mustang, made a little detour, came right in front of the herd, cut across their path at a right angle, and then galloped leisurely on to the edge of that bluff; halted, and looked around at that wild mass of beef coming right toward him. He was cool as a cucumber, though I expected to see him killed, and I was so excited I could not speak.

"Well, when the leader had got within about a quarter of a mile of him, I saw them try to slack up, though they could not do it very quick. But the whole herd seemed to want to stop, and when the cows and steers in the rear got about where the cowboy had cut across their path, I was surprised to see them stop and commence to nibble at the grass. Then the whole herd stopped, wheeled, straggled back, and went to fighting for a chance to eat where the rear guard was.

"You see, that cowboy had opened a big bag of salt he had brought out from the ranch to give the cattle, galloped across the herd's course, and emptied the bag. Every critter sniffed that line of salt, and, of course, that broke up the stampede. But I tell you it was a queer sight to see that man out there on the edge of that bluff quietly rolling a cigarette, when it seemed as though he'd been lying under 200 tons of beef in about a minute and a half."

Ideas not Property until Patented.

The Philadelphia *Times* of May 24 states that "Charles A. Kortenhaus' action against the American Watch Company, of Waltham, Mass., to recover royalties on an improvement in stem winding watches that he made, and which, he averred, the defendants have put to use, was nonsuited yesterday by Judge Mitchell. Kortenhaus swore that he had submitted his invention to the company's inspection with the view of selling it. The company refused to purchase. Kortenhaus discovered afterward, he swore, that the company had adopted the improvement. He had made the fatal mistake of not having his improvement patented. The court, in dismissing his action, ruled that there was no right of property in an idea as an idea, and that it could only be made property by letters patent."

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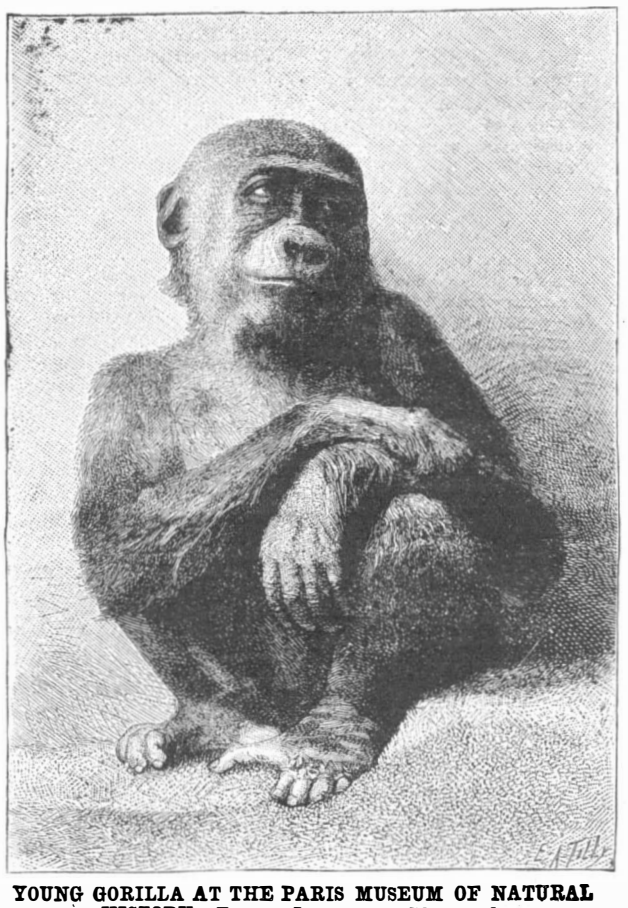
THE GORILLA AT THE PARIS MUSEUM OF NATURAL HISTORY.

At the beginning of last winter the Paris Museum of Natural History came into possession of a young male gorilla that had been recently imported from Gaboon. This is the first living specimen of this large species of anthropomorphous monkey that has ever reached France. A study of it presents a great interest, as well from a zoological point of view as from that of the development of intellectual faculties.

This gorilla is about three years of age, and already has all its milk teeth, as well as its canines, which are long and pointed, and considerably exceed the molars. Its character is very different from that of the chimpanzee and orang-outang, for it is just as savage, morose, and ugly in captivity as the latter are mild and sociable. It has never shown its keeper the least mark of affection. It allows itself to be touched only with the greatest repugnance, and it usually responds to caresses by biting. It takes no part in the play of the other monkeys, and seems to scarcely tolerate them alongside of it. It is not very active, and usually remains squatting in one corner of its cage, or seated upon a branch with its back against the wall, and scarcely ever moving except to go in quest of food. It makes skillful use of its hands, which are very strong. Its lips are less movable than those of the chimpanzee, especially the lower one, which it never protrudes in the form of a spoon when it drinks. Its extremely movable eyes, the prominence of its superciliary arches, its flattened nose, and its nostrils of immoderate width, all give it a very peculiar physiognomy. Its intelligence seems to be but slightly developed, and, at all events, very inferior to that of other anthropomorphous apes, even of the gibbon.—*La Nature.*



YOUNG GORILLA AT THE PARIS MUSEUM OF NATURAL HISTORY.—*From an Instantaneous Photograph.*

STREET ELEVATOR AT STOCKHOLM.

A part of the suburb Soedermarlin, of Stockholm, is located on a steep and quite high hill, which is known as Mosebake (Moses' Hill), and from which hill or elevation a beautiful view can be had of the surrounding country, woods, lakes, etc. Elegant gardens have been laid out on the Mosebake, but, as it is very difficult to climb up this steep hill, foreigners and visitors generally neglected to visit this most beautiful part of Stockholm. Capt. Knut Lindmark conceived the idea of erecting a tower in the lower part of the town, and connecting the top of the tower with the plateau on the top of the hill by a bridge, which, with the tower, was completed March 19, and is now in public use. The iron bridge, which is provided with four spans, is 490 feet long. The first column, shown in the annexed cut, taken from the *Illustrirte Zeitung*, is 114 feet high, and in the same two elevator cars are located, each elevator car being adapted to accommodate about fifteen persons. The elevator cars are raised by means of a steam engine and a hydraulic press at a speed of about 55 inches a second, so that the cars are raised or lowered the entire height of the tower in about half a minute. The lower part of the tower is surrounded by a station, which contains living apartments for the engineer and conductor. On the top of the tower a restaurant, having a double veranda, is built, from which veranda a beautiful view is obtained of those parts of the city surrounding the tower. About 3,000 persons are transported each way daily. Two cents is charged for riding up in the elevator, and about one and a quarter cents for riding down in the same. On another page will be found an article suggesting the adoption of a similar structure to the above for transferring passengers from the different ferries to Broadway in this city. It might be arranged for both a footway and cable railroad. There are many other places where the combined elevator and causeway could be advantageously employed, for instance, between Hoboken and Jersey City Heights and the villages beyond.

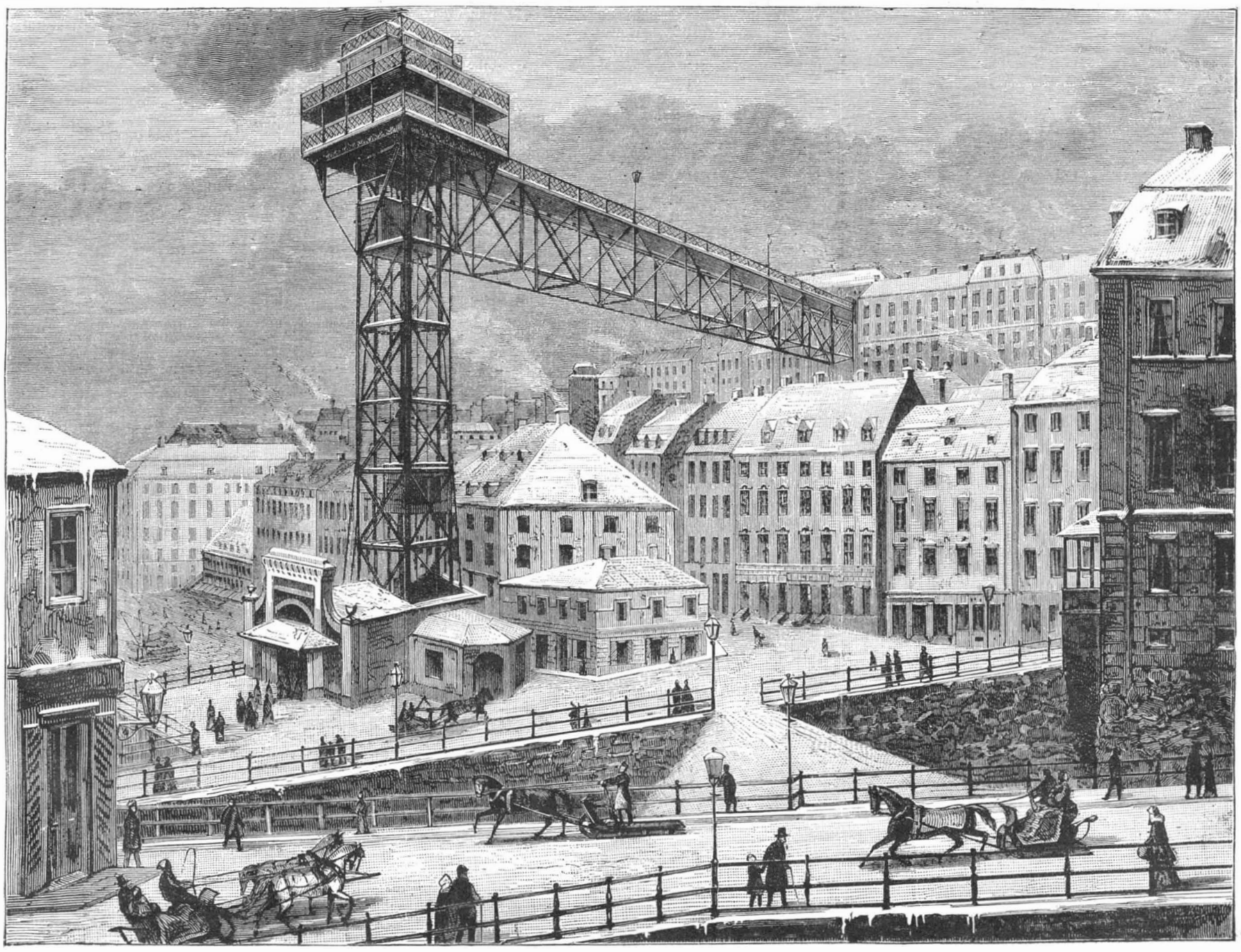
Capitalists interested in elevated railroads will do well to consider if their interests will not be promoted by extending branch lines of road to all the ferries in the city, as has already been done at 34th Street, or by some plan similar to the one suggested by the illustration.

The Poisons of Well Waters.

In an article on water analysis by Prof. H. B. Cornwall, in the *School of Mines Quarterly*, he states experiments are now in progress at Columbia College laboratory to determine whether any opinion as to the probably more or less nitrogenous nature of organic matter in water can be formed from a comparison of the observed amounts of "albuminoid ammonia" and "oxygen consumed by organic matter." Tests made on such characteristic liquids as beef tea and infusion of soft and fresh wood chips gave decisive results, but the investigation has not yet been carried far enough to show whether the approximate proportion of organic carbon and nitrogen can be determined in this way, or whether any clew to the source of the organic matter in ordinary waters can be so obtained.

Attention is also called to the recent article by Darton, giving some very interesting results of experiments made by him on the volatile nitrogenous organic matter which Remsen, and later, Marsh, have shown to exist in many waters. Darton concentrated the distillate from various well waters, and tested the residue by injecting it under the skin of rabbits, producing in most cases either death or very serious disturbances in the animals. These marked effects were obtained from waters which had been shown to contain much volatile nitrogenous matter.

EVERY pupil must have been vaccinated before he will be received in the lyceums and colleges of France.



THE GREAT STREET ELEVATOR, STOCKHOLM SWEDEN.

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ENGINEERING INVENTIONS.

A flood gate has been patented by Mr. James M. Metcalf, of Enfield, Ill. The gates are made to stand sufficiently above the bed of the stream to allow the ordinary flow of water, and in connection therewith are braces, check cords, or chains, strong posts, and a supporting frame, to allow of the gates being swung open as desired.

A vehicle propelled by compressed air has been patented by Mr. Daniel S. Troy, of Montgomery, Ala. The axle or axles and reach are made hollow and connected to serve as a reservoir for compressed air, as is also the body of the vehicle, the reservoirs being adapted to be charged at a station, whence the vehicle may be sent out as a self-contained motor.

A hydraulic elevator has been patented by Mr. Oliver P. Rice, of New York city. This invention has for its object, by special construction and combinations, to facilitate the operation and increase the efficiency of hydraulic elevators, it being easy to regulate the speed of travel of the cage by opening or closing a valve, while the elevator may be stopped at any desired point by cutting off the supply or discharge pipe.

A spark arrester has been patented by Mr. William C. Beal, of Fernandina, Fla. There is a hollow truncated cone which concentrates the current of sparks at the center of a hollow cone above, in which they are deflected to the side of the stack and given a whirling motion; there is also a guard in the upper part of the stack for preventing the escape of sparks that may turn upward from the place where they are deflected.

MECHANICAL INVENTIONS.

A polishing wheel has been patented by Mr. Henry Bintz, of New York city. It is made with a block cast with hub, spokes, and rim in one piece, and with holes in the rim provided with wire drawn knots, such wheels being cheaply made and more durable than ordinary polishing wheels.

A double gauge has been patented by Mr. John Hellriegel, of Marine, Ill. The invention relates to gauges used by cabinet makers, carpenters, etc., for making working lines parallel to the edges of the work, its object being to enable the mechanic to gauge two lines at different distances from the edge of the work by two strokes of one gauge.

AGRICULTURAL INVENTIONS.

A rotary sulky harrow has been patented by Mr. William H. Southward, of Mendon, Ohio. By this invention one of the wheels may be turned slower than the other, as in turning around, without affecting the revolution of the axle, the gear wheels can be readily thrown out and into gear, and the teeth of the harrow may be held out of the ground, all to promote convenience and thoroughness in harrowing.

A grain drill has been patented by Mr. Abram L. Reese, of Chase, Kansas. This invention relates to improvements on former patents issued to the same inventor, and covers certain details of construction whereby, as the machine is drawn along a row of plants, the grain will be drilled into the soil upon both sides of the row, and without doing any injury to the plants.

MISCELLANEOUS INVENTIONS.

A window sash has been patented by Mr. Louis L. Arnold, of Chicago, Ill. The object of this invention is to provide a sash which can be easily removed from the window frame for washing, painting, etc., for which purpose a novel combination of parts is provided.

A calendar has been patented by Mr. Henry S. Stevens, of Keene, N. H. It is adjustable for any year for a long term of years, the adjustments are easily understood and can be quickly made, and the device has a wider range of use than the ordinary adjustable calendar.

A fence post has been patented by Mr. Ely N. Obert, of Cuba, N. Y. It is hollow, open at top and bottom, with its sides inclined inwardly toward the top, and with apertures to receive the rails, the post and rails being held in place by stones placed in the post.

A portable fence has been patented by Mr. William Cockayne, of Geetingsville, Ind. This invention relates to improvements in this style of fences, for effecting convenience, economy, and increased durability, and covers a peculiar construction and arrangement of parts.

A headed slug nail has been patented by Mr. John Hyslop, Jr., of Abington, Mass. The nail has a rectangular wedge shaped point and a rectangular head, the end parts connected with the body by tapered webs, so the heads will not crack the leather, and the nail will hold the leather firmly.

A folding table has been patented by Mr. William E. Eldred, of Brooklyn, N. Y. The object of this invention is to provide a new and improved button for folding tables, for the purpose of holding the legs firmly in place when the table is set up, and it consists in the special construction and arrangement therefor.

A necktie fastener has been patented by Mr. Weisel Beale, of Shawneetown, Mo. A slotted plate is adapted to be secured to the pasteboard back or frame of the tie, in combination with a locking lever and spring, so the tie is securely held, or may be easily removed by throwing back the locking lever.

A steam heater has been patented by Mr. William C. Bronson, of Saratoga Springs, N. Y. The water is contained in small tubes and chambers, directly among and against which the heat and products of combustion circulate, making a heater that is cheap, easy to handle, and that will rapidly generate steam.

A portable fruit drier has been patented by Mr. Joseph N. Parker, of Vineland, N. J. The shell of the drier is made of zinc, tin, or other suitable material, and is designed to be placed over an ordinary cooking stove or range, to facilitate the drying of fruits, vegetables, etc., and promote convenience and economy in the operation.

A hay carrier has been patented by Mr. Abner J. Burbank, of Harvard, Ill. It consists of a duplicate contrivance of catch hooks for holding up the hay fork by the head of the shaft of the hay fork pulley to better advantage than a single catch will, with an improved arrangement of the locking and tripping levers and the catch and trip blocks.

A cracker machine has been patented by Messrs. Charles S. Fowler, of Brooklyn, N. Y., and Lucius A. Rockwell, of New York city. The object of this invention is to promote convenience in adjusting cracker machines, which is effected by a special combination and a novel construction and arrangement of parts.

An improved shirt has been patented by Mr. Jacob Cohen, of New York city. This an open front shirt in which the center piece or outer fly may be readily secured in the center of the front, and the under fly made to form a complete lap with the outer fly, to prevent gaping of the parts while the shirt is being worn.

A horse collar has been patented by Mr. Herman T. Detert, of Faribault, Minn. The collar is adjustable, and has metallic attachments forming flanges for the hames, with means for spreading and contracting the collar at the bottom, with special devices for easily effecting a perfect fit of the collar to the horse.

A fountain pen has been patented by Messrs. Charles H. Court, of Jersey City, N. J., and Albert J. Kletzker, of New York city. The pen is cheaply made and durable, and is always in condition for immediate use, the feed of ink being regulated exactly in accordance with the demand, neither too rapid nor too slow.

A design for a piano case has been patented by Mr. Anton Gunther, of Toronto, Ontario, Canada. It is an upright piano case of an irregular pentagonal figure, when viewed from the front, with one of its two longer sides horizontal and the other nearly so, and its keyboard cover included within the limits of the circumscribed lines of the pentagon.

A toy has been patented by Mr. James E. A. McAllister, of Albany, N. Y. It is a hollow ball of two sections hinged together, and held by a spring or elastic band, and having an aperture opposite the hinge; the ball has an elastic cord, and is thrown against headed pegs held in a board, withdrawing them therefrom.

A shade roller hanger has been patented by Mr. William J. Mullen, of New York city. The invention covers the combination, with a disk or plate with a screw on its upper surface and lugs on its lower surface, of a hanger pivoted between the jaws, with a socket at its free end for receiving the end pin, whereby the roller can be hung easily and rapidly.

A tramping attachment for baling presses has been patented by Mr. Gedeon P. Thompson, of Crowley's Station, Texas. The invention covers tramplers, and a crank with power mechanism, for beating in the cotton on the follower preparatory to closing the press, and thus enable bales of full size to be made in a smaller case.

A millstone dressing machine has been patented by Mr. John Miller, of Milton, Oregon. It is a rotary self-feeding apparatus, in which diamonds are used as the cutters, and dispensing with proof and pen-staff and other devices heretofore used for the purpose, while dressing burr or other millstones perfectly true with much saving of labor.

A vehicle wheel has been patented by Mr. Jacob Dietrich, of Brushland, N. Y. This invention covers a novel construction in making up the felly portion of the wheel, which is metal, and in the manner of securing the spokes, so that lightness is combined with strength, without impairing the elasticity, and the tire is prevented from working off the wheel.

A portable table for transferring flour from barrels into bags has been patented by Mr. William Cochrane, of Brooklyn, N. Y. It is an elevator table, of a size adapted to have a barrel placed upon its side upon it, and with side and end fenders leading to a spout or hopper for conducting the flour from the barrel and table into the bag held under the spout or hopper.

A combined firing and bell ringing burglar alarm has been patented by Mr. Charles L. Morehouse, of Brooklyn, N. Y. It is formed of a cap or cartridge firing device and a bell operated by a clock work mechanism, the device and bell being so arranged that both are released at one time, and it is so constructed that it may be easily attached to a door or window sash.

A furnace has been patented by Messrs. John A. Topliff, Edward S. Cross, William S. Cox, and John A. McCollum, of Elyria, Ohio. With two stoves or furnaces and a chimney is a single flue with separate openings connecting with each of said stoves above and below their fire grates, and with the chimney and its dampers, all to more completely utilize the fuel, and prevent the escape of smoke and foul gas.

A snow plow has been patented by Mr. John Q. Day, of Red Cliff, Col. This invention relates to snow plows with a wheel and annular groove in each side, for forcing the snow out laterally, slides or gates being arranged to close the grooves behind the snow, to hold it thereon until carried to the upper side, there being also a flaring arrangement of the outside rim of the wheel to facilitate the discharge of the snow.

A fruit picker has been patented by Mr. John S. Spraker, of Kokomo, Ind. In combination with a pole or handle, and a hoop and bag thereon, is another handle with a curved wire at one end, and secured to the first handle by loops, so a person taking the picker by the handles, and standing in a convenient position, can break the stem of the fruit and allow it to fall into the bag without injury.

An oil press plate has been patented by Mr. Clark Woodman, of Omaha, Neb. This invention dispenses with the hair or mat-faced plates heretofore used, and the metal plates are made to constitute and comprise the mats, being of proper form to prevent the meal from squeezing out, with provision for the escape of the expressed oil, and space is economized in the press.

A heating and ventilating device for buildings has been patented by Amanda M. Hicks, of Clinton, and Alonzo Dishman, of Paducah, Ky. The invention covers novel combinations of fresh air supply pipes with the chimney or flue of a building, also with a stove grate or fire place in a lower floor, with drums in the upper rooms of a building, whereby better results are obtained than by previous methods.

A fire escape has been patented by Messrs. John Larson and August W. Hagstrom, of Stockholm, Wis. A specially contrived basket or chair is made to descend by a rope running over a series of pulleys, acting partially as brakes, but the speed of which may be regulated by a cam lever, the whole being easily operated and not liable to get out of order, and so made that it can be packed in a traveling bag.

A hand and foot power device has been patented by Mr. Owen E. Jones, of Wymore, Neb. This is a novel construction, promoting economy in the application of power, as by its use a man is enabled to drive two or more machines in the time in which he would drive one without it; the convenience of the operator is also promoted, and power may thus be readily applied to washing machines, pumps, saws, churns, etc.

A press for packing bran, sawdust, etc., has been patented by Mr. Arthur L. Battson, of Morrisburg, Ontario, Canada. This invention covers an improvement on a former patent issued to the same inventor, and consists in the combination, with the press casing and the ends of the hoop bar, of spring catches, so the sack cover plate, when forced down by the follower, will be caught and held as the follower is again raised.

A burglar alarm for safes has been patented by Mr. William Y. Cruikshank, of Danville, Pa. A roughened strip or plate is connected with a device to be operated by compressed air, said device, etc., being combined with clamps for holding matches and the fuses of explosive cartridges, so that, if the safe is blown open, the compressed air causes the matches and cartridges to ignite, and make an explosion. In a further patent of the same inventor, the spring hammer of a trigger lever, revolved by a shaft, and worked by compressed air, is made, when the safe is violently opened, to explode a cartridge and thus give an alarm.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted.—Annealer for Malleable Iron Works; best of wages paid. Address "Y. L." Box 773, New York City.

Machine for grooving chilled rolls for flour mills. Pratt & Whitney Co., Hartford, Conn.

"Give me time, Aunt Tabithy," said I, "a good dinner and after it a pipe of good tobacco, and I will serve you such a sunshiny sheet of revery, all twisted out of smoke, as will make your kind old heart ache."—*Reveries of a Bachelor.* Ik Marvel knew what good tobacco was, and how to enjoy it. A pipe of Blackwell's Durham Long Cut was to him a reservoir of Elysian dreams, whose reading will make the world laugh and cry for all time.

New and Second-hand Lathes, Drills, Planers, Engines, Shafting, etc. Bought, sold, and exchanged. A. G. Brooks, 261 N. 3d St., Philadelphia.

Cyclone Steam Flue Cleaner. The best in the world. Crescent Mfg. Co., Cleveland, O.

Hercules Water Wheel--most power for its size and highest average percentage from full to half Gate of any wheel. Every size tested and tables guaranteed. Send for catalogue, Holyoke Machine Co., Holyoke and Worcester, Mass.

Stephens' Bench Vises are the best. See adv., p. 365.

All Scientific Books cheap. School Electricity, N. Y.

If you want the best cushioned Helve Hammer in the world, send to Bradley & Company, Syracuse, N. Y.

Springs. List free. T. F. Welch, 11 Hawkins St., Boston.

60 Lathes, new and second-hand, 12" and 14" swing, plain and screw cutting. J. Birkenhead, Mansfield, Mass.

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Rubber, Linen, and Cotton Hose. Rubber, Leather, and Cotton Belting. Greene, Tweed & Co., New York.

The Hyatt filters and methods guaranteed to render all kinds of turbid water pure and sparkling, at economical cost. The Newark Filtering Co., Newark, N. J.

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Steam Boilers, Rotary Bleachers, Wrought Iron Turn Tables, Plate Iron Work. Tippett & Wood, Easton, Pa.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Electrical Alarms, Bells, Batteries. See Workshop Receipts, v. 3, $2.00. E. & F. N. Spon, 35 Murray St., N. Y.

Gear Cutting. Grant, 66 Beverly St., Boston.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent agency, 361 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Curtis Pressure Regulator and Steam Trap. See p. 365.

Munson's Improved Portable Mills, Utica, N. Y.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423. Pottsville, Pa. See p. 365.

Woodwork'g Mach'y. Rollstone Mach. Co. Adv., p. 364.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 286.

Drop Forgings. Billings & Spencer Co., Hartford, Conn.

The Porter-Allen High Speed Steam Engine. Southwark Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

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Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 398.

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NEW BOOKS AND PUBLICATIONS.

THE MANHATTAN ILLUSTRATED MAGAZINE. The Manhattan Magazine Company, publishers, Temple Court, New York.

The next—July—issue commences a new volume of this popular magazine, and if future issues improve as the successive previous ones have done since the publication was started, the older monthlies will have to look to their laurels, for their young rival seems to be pressing onward very rapidly.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) F. A. W. says: I I have a small terrestrial telescope, which has only two lenses; the eye lens is double concave, but the object glass I am not certain about, as it is spun into its cell. The telescope has a small field, but splendid definition. Could a practical one, that is, one for say tourist purposes, be made on this principle? If so, kindly give diameters, foci, and distance apart, and kind of lens required. A. Your telescope is of the Galilean form, and the type that of the ordinary opera glasses. When well made, it gives a very clear definition with exact image and small field, also small amplification; on this latter account it is not used for instruments of power. You can make a very good field glass with a plano-convex glass of fifteen inch focus, 1½ inch diameter, plane side next the eye, and a plano-concave glass of from 3 to 6 inch focus three-fourths inch diameter placed at its own focal distance within the focus of the object glass, concave side next the eye; the shorter focus eye lens giving the greater power. The power with a 3 inch eye lens being 5, and with a 6 inch eye lens 2½ times.

(2) W. E. L. asks: 1. Is there any machinery in successful operation for manufacturing lumber, furniture, etc., from sawdust? A. Sawdust and shellac pressed in moulds have been used for ornaments for furniture and fancy articles, and there is a so-called

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terra cotta lumber made of sawdust and clay, then burned in an oven. This is as near making lumber out of sawdust as we have yet come. 2. A New England paper recently told of a Western mill that was running the largest circular saw in the world, 60 feet diameter, 700 revolutions, and 12 inches feed. What are the true figures? A. The big saw you speak of was reported as 6 feet in diameter, and we believe a few such are in use in Wisconsin and Minnesota, although 60 and 66 inches have until very lately been the largest sizes.

(3) S. H. B. asks for information upon the subject of slate pencil manufacturing from soapstone—the machinery used and the process employed. A. Soapstone pencils are mostly made in New Hampshire near the quarries. The soapstone is sawed in blocks the length of the pencil, then into slabs of the proper thickness, then run through a set of thick saws that cut half way through the slab and round one side, when the slab is turned over and run through on the other side. Or in better machines there are two sets of saws, above and below, so that the slabs are pushed through, one following another, and are delivered finished except pointing. The pointing is done with a machine or a quick running grindstone.

(4) H. B. says: The question how to mix and use the composition for enameling iron, etc., was satisfactorily answered. 1. Can I use a stove oven to dry the composition in, if so, at what degree of heat must the oven be before putting the article to be dried in? A. Any oven will do to dry in. Hot enough to evaporate water. 2. Is it really necessary that the glazing should be used, or cannot the glazing be used without putting on the other composition? A. The glazing makes the finish, and assists to vitrify the first coat. The glazing alone would show the color of the iron. It might answer your purpose. 3. Can either of the compositions given in above paper be used on sheet iron or tin, as well as iron? A. You can enamel sheet iron by taking off the scale with muriatic acid 1 part, water 4 parts. When the scale is loosened, wash in water and dry quickly in an oven; you cannot enamel tin.

(5) P. J. B. and H. S. L.—Gold having the red color of 14 carat gold may be deposited by the battery in the following manner: Prepare a solution of copper cyanide by adding potassium cyanide to a solution of copper sulphate until the precipitate at first thrown down is redissolved. Add to this a solution of gold cyanide (prepared by dissolving 1 ounce of fine gold in 28 pennyweights nitric acid and 2 ounces hydrochloric acid and adding one quart hot water, and treating this solution with 5 ounces potassium cyanide in 1 quart water) in sufficient quantity to give on trial the desired color of gold deposit. When using this solution, the positive electrode plate should be of gold of the same color as that desired to be deposited. For 10 carat gold the process is similar.

(6) J. P. asks (1) how to take the rust off a bicycle, the rust having been on over a year. I have tried oil and sand, also oil and emery paper. A. Rub with kerosene oil or spirits of turpentine. 2. Also, is there any solution to make steel shine just as if it was nickel plated? A. Nothing except polishing. 3. Also of a solution, when you dip nickel or silver pieces into it, it will gold plate them, without a battery. A. Wash thoroughly a quarter of an ounce of gold chloride; then add it to a solution of 2 ounces potassium cyanide in one pint of distilled water; shake well, and let stand until the chloride is dissolved. Add 1 pound prepared Spanish whiting, expose to the air till dry, and then put away in a tight vessel for use. When applied, it is mixed into a paste with water, and rubbed on the surface of the article with a piece of chamois skin or cotton flannel. The surface of the article should be thoroughly cleansed before the plating powder is applied.

(7) W. S. N. writes: I am reclaiming solder, and would like to know of a good method of cleaning it from impurities, such as wood ashes? Also if you can tell me whether it would pay to manufacture solder on a small scale? A. We hardly think the practice of reclaiming solder a paying occupation. Something is done in the way of separating the scrap tin from iron in refuse tin cans. The metals are separated by means of electrolysis, and the tin converted into the sulphide, in which it is commercially known as mosaic gold. The manufacture of solder can be done cheaper by large factories. 2. Can I remelt light sheet iron, and what kind of a furnace would you recommend to use? Could the iron be used for small castings? A. The iron would be burnt in melting it, and therefore would be unsatisfactory for castings. 3. Are there any practical books on these subjects that would be useful to me? A. Spons' Workshop Receipts would probably contain information on the subjects you are presumably interested in.

(8) E. C. writes that a liquor of meal and water, that has been fermented, soon turns sour, and he says: "I wish to arrest the further formation of acid at a certain stage of sourness, and keep it at this same sourness" A. We would recommend you to use salicylic acid. This agent is used twice in the process of preserving beer; first sufficient is added to act on the lactic fermentation but not on that of yeast, and the second in quantity sufficient to arrest the alcoholic fermentation before it degenerates into the acetic stage. The two doses together do not amount to more than 0·05 grain per liter of the beer.

(9) C. J. T. asks: What are the best means to adopt to press flowers, leaves, and fern fronds, so that the flowers will retain their colors and the fern fronds their greenness. What is the best substance to use for making them adhere to cardboard, etc.? And how are flowers preserved? A. For this information see page 2536 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 159. Ordinary mucilage will cause them to adhere to cardboard. Flowers may be preserved by dipping them into melted paraffin, withdrawing them quickly. The liquid should be only just hot enough to maintain its fluidity, and the flowers should be dipped one at a time, held by the stalks, and moved about for an instant to get rid of air bubbles.

(10) I. R. P. asks how to bleach beeswax without the use of revolving cylinders? A. The sun is the best agent. Chemicals for bleaching beeswax tend to injure it. The simplest plan is to slice the wax into thin flakes, and lay it on sacking or coarse cloth stretched on frames resting on posts to raise them from the ground. The wax should be turned over frequently and occasionally sprinkled with soft water, if there be not dew and rain sufficient to moisten. If it be found after exposing it for some time that it is still yellow inside, it will be best to melt it again, and flake and expose it again. Sometimes the wax is bleached by passing melted wax and steam through long pipes so as to expose the wax as much as possible to the action of the steam, thence into a pan heated by a steam bath, where it is stirred thoroughly with water and then allowed to settle. The repetition of this process several times before sun bleaching facilitates the process. 2. What is the most economical way to make wax? Should dirty comb ever be used? A. The beeswax is obtained by melting the combs, after expression of the honey, in boiling water, on which it soon floats; it is then left to cool, remelted without water, and run into moulds of various sizes and forms. By removing any dirty comb it naturally follows that the process will be a more rapid one and the result more satisfactory.

(11) E. M. asks how to deaden a floor so that the second story can be used for roller skating, and not make a noise in the lower or ground floor story. A. To deaden a floor partially, perhaps enough for roller skating, cover the old floor with asphalt felt, such as is used for roofing, or thick straw board, or three thicknesses of paper carpet lining. Lay a new floor upon this by laying wall strips upon the paper and nailing the matched floor stuff to the strips. There are a variety of ways more expensive and better, such as a double ceiling below, a double or independent floor over and clear of the old floor, plaster deafening under the old floor, etc.

(12) E. L. F. asks for further particulars about how to make hair dye from green walnut shells. A. The article is the expressed juice of the bark or shell of green walnuts. To preserve this juice a little rectified spirit is commonly added with a few bruised cloves, and the whole digested together with occasional agitation for a week or fortnight, when the clear portion is decanted, and if necessary filtered. The dye will stain the scalp or any other textile substance it may come in contact with. To apply it, the hair is first thoroughly cleansed with sal soda, and the liquid applied same as any hair wash. An ordinary washing of the hair with the liquid ought to suffice, but in some instances several repetitions are necessary. As to the frequency of the application, this can only be determined by watching the results.

(13) A. E. C. asks how to make an enameled flesh color on raw hides, as used in making artificial limbs. A. We would advise to first coat the raw hide with a thin coat of rose madder and then apply a very heavy coat of best wearing body varnish, and allow it to dry very thoroughly before using it.

(14) F. H. asks the chemical composition of the bleaching powder used in paper mills, and the mode of manufacture for commercial uses. A. Bleaching powder is the result obtained by bringing chlorine gas in contact with slaked lime. In England it is largely obtained in connection with the soda ash prepared from salt or sodium chloride. Its chemical composition is variously given by the different chemists; it is generally considered to be a mixture of hypochlorite of lime and calcium chloride with water.

(15) F. E. W. asks how a good black aniline glycerine ink can be made to be used for rubber stamps? Or in other words, how can he color glycerine black? A. A very good black stamping ink consists of 16 parts of boiled linseed oil varnish, 6 parts of the finest lamp black, and 2 to 5 parts of iron perchloride. This diluted with one-eighth the quantity of boiled oil varnish is used with stamps. Perhaps the following will be more in accordance with your request, nigrosine black 1 part, glycerine 4 parts, and sufficient water to make the ink of proper consistency.

(16) C. A. B. writes: I have been trying for some time to get a steam radiator bronzing that will not tarnish or burn off after it has been on a week, as most of the articles used now do. What is the best liquid to mix the bronze with to produce that result? A. Use a dry bronze powder, and then cover with a coat of transparent colorless varnish. This will be found more satisfactory than any mixture.

(17) E. L. F. asks how enamel is applied on metal, such as used on jewelry, and whether different colors require different treatment? A. Enamels are a species of vitreous varnish, colored by means of metallic oxides and applied in thin stratum to brightly polished metallic surfaces, on which it is fused by the flame of a blowpipe or by the heat of a small furnace.

(18) X. Y. Z. asks if coal oil attracts lightning. A. No.

(19) W. A.: A "saturated solution," in the case you ask, is one which has taken up all of the white, dry, crystalline powder that the water will hold. Another good and very old plan for preserving eggs is as follows: To each pail of water add two pints of fresh slaked lime and one pint of common salt; mix well, fill your barrel half full with this fluid, put your eggs down in it any time after June, and they will keep for many months.

(20) J. O. N. of Newark, N. J., says: Inclosed please find specimen of insect found on potato vines Can you tell me what they are? Also what will kill or banish them? I find them worse than potato bugs, for Paris green will soon rid me of them; but these things I can find nothing to kill, except I also kill the vine. I have tried Paris green, whale oil soap, tobacco juice, and kerosene oil; all failed except kerosene, which killed or banished the insect, but also killed the vine. A. The insect referred to arrived in a very dilapidated condition, but the remains seemed to indicate that it was the common *Anasa tristis*, commonly found on squashes and cucumbers, but occasionally feeding upon the potato. As it has no jaws, but pumps up sap through a beak, it is evident that arsenical poisons will have no effect upon it. Our correspondent has hit upon the right remedy (kerosene), which may easily be rendered innocuous to the plant by forming an emulsion with milk or soap and then diluting with water. The subject of kerosene emulsions has already been treated at length in our columns by Professor Riley, and it will be unnecessary to repeat the formulæ.

(21) H. G. asks how to make good tallow candles. A. We presume that the inquiry has reference to candles made with moulds rather than the dip variety. The ingredients are about one-third beef and two-thirds mutton suet. We would recommend the use of 1 pound of alum with each 5 pounds of tallow. Dissolve the alum in water, then put in the tallow, and stir until both are melted together, then run in moulds. This part of the operation is conducted as follows: The wicks are secured in the center of each mould by passing over the sticks, one of which is laid over the top of the mould (corresponding to the bottom of the candle), and the other against the bottom points of the moulds. The end of the twisted wick is fastened to the stick on the top of the mould, and is drawn by a piece of hooked wire through each mould in succession, leaving a loop outside the bottom points of the moulds, the loops are secured there by the bottom stick passing through them; the wicks are to be drawn tight, and the last end tied to the upper stick. The melted tallow is then poured into the moulds and allowed to stand about 6 hours in a cool place, after which the bottom stick must be taken out of the loops and the candles withdrawn from the moulds. The tallow should not be heated much more than is necessary to melt it.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. G.—The specimen is selenite, a variety of gypsum or calcium sulphate. Its principal uses are for agricultural purposes, and also as plaster of Paris in internal house decorations. Its price ranges from $12.50 per ton up to $3.50 per barrel in San Francisco.

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June 10, 1884,

AND EACH BEARING THAT DATE.

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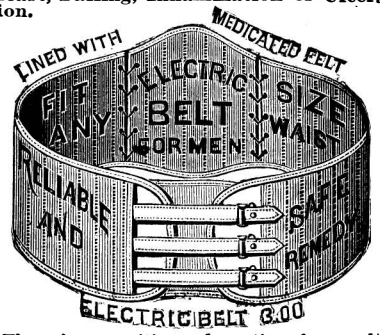

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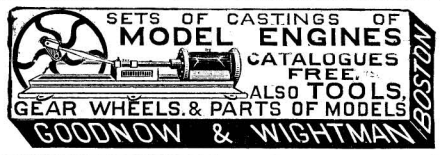

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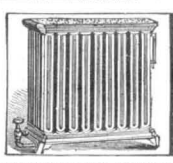
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